

Introductory.]

[Price 5s.

OFFICIAL
Henry Cole
Descriptive and Illustrated
CATALOGUE.

Royal
Commissioners.

By Authority
of the



INTRODUCTORY.

LONDON:

SPICER BROTHERS, WHOLESALE STATIONERS; W. CLOWES & SONS, PRINTERS;
CONTRACTORS TO THE ROYAL COMMISSION,
29 NEW BRIDGE STREET, BLACKFRIARS, AND AT THE
EXHIBITION BUILDING.

1851.

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PLAYFAIR.)

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Royal Highness the Prince of Wales.

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EX. 1851. 22

OFFICIAL

Descriptive and Illustrated Catalogue

OF THE

GREAT EXHIBITION

OF THE

WORKS OF INDUSTRY OF ALL NATIONS,

1851.

THE EARTH IS THE LORD'S AND ALL THAT THEREIN IS;
THE COMPASS OF THE WORLD AND THEY THAT DWELL THEREIN.

PART I.

INTRODUCTORY,

AND

SECTION I.—RAW MATERIALS.—CLASSES 1 to 4.

NEW EDITION.

LONDON:

SPICER BROTHERS, WHOLESALE STATIONERS; W. CLOWES & SONS, PRINTERS;
CONTRACTORS TO THE ROYAL COMMISSION,
29 NEW BRIDGE STREET, BLACKFRIARS, AND AT THE
EXHIBITION BUILDING.

EX. 1851. 23

NE NOSTRA, ISTA QUÆ INVENIMUS, DIXERIS—
INSITA SUNT NOBIS OMNIUM ARTIUM SEMINA,
MAGISTERQUE EX OCCULTO DEUS PRODUCIT INGENIA.

HUMANI GENERIS PROGRESSUS,
EX COMMUNI OMNIUM LABORE ORTUS,
UNIUSCUJUSQUE INDUSTRIÆ DEBET ESSE FINIS :
HOC ADJUVANDO,
DEI OPT: MAX: VOLUNTATEM EXSEQUIMUR.

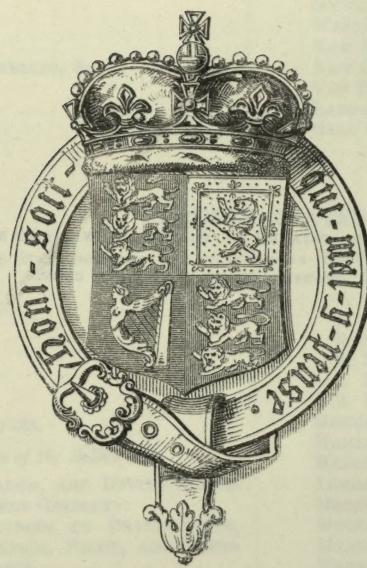


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HPS
14.05.96

By Authority
of the

Royal
Commission.



LONDON: PRINTED BY WILLIAM CLOWES AND SONS,
PRINTERS TO THE ROYAL COMMISSION,
STAMFORD STREET AND CHARING CROSS.

C O U N T R I E S E X H I B I T I N G.

UNITED KINGDOM.—CLASSES 1 to 30.

COLONIES.

EAST INDIES, INDIAN ARCHIPELAGO, &c.
 JERSEY AND GUERNSEY.
 CEYLON.
 IONIAN ISLANDS.
 MALTA.
 CAPE OF GOOD HOPE AND NATAL.
 WEST COAST OF AFRICA.
 CANADA.
 NOVA SCOTIA.
 NEWFOUNDLAND.
 NEW BRUNSWICK.
 ST. HELENA.
 MAURITIUS, SEYCHELLES, &c.
 ST. DOMINGO.
 GRENADA.
 MONTSERRAT.

JAMAICA.
 ST. KITT'S.
 BARBADOES.
 ANTIGUA.
 BRITISH GUIANA.
 BAHAMAS.
 TRINIDAD.
 FALKLAND ISLANDS.
 BERMUDAS.
 SOUTH AUSTRALIA.
 WESTERN AUSTRALIA.
 NEW ZEALAND.
 NEW SOUTH WALES.
 VAN DIEMEN'S LAND.
 LABUAN, BORNEO, &c.
 GOLD COAST AND ASHANTEE.

FOREIGN STATES.

AMERICA, UNITED STATES OF.

AUSTRIA.

BELGIUM.

BRAZIL.

CHILI.

CHINA.

DENMARK.

EGYPT.

FRANCE AND ALGIERS.

GERMANY.—*States of the Zollverein.*

1. PRUSSIA, BADEN, AND UNITED STATES OF NORTHERN GERMANY.
 - a. PROVINCES OF BRANDENBURG, SILESIA, POSEN, AND POME-RANIA.
 - b. GRAND DUCHY OF BADEN ; SOUTHERN PARTS OF THE WEST PROVINCES OF PRUSSIA AND ELECTORAL HESSE.
 - c. PROVINCES OF PRUSSIA AND LITHUANIA.
 - d. NORTHERN PARTS OF ELECTORAL HESSE, AND OF THE PRUSSIAN WEST PROVINCES ; PRINCIPALITY OF LIPPE.
 - e. GRAND DUCHY OF SAXONY, PRUSSIAN SAXONY, BRUNSWICK, ANHALT, AND STATES OF THURINGIA.

GERMANY.—*States of the Zollverein.*

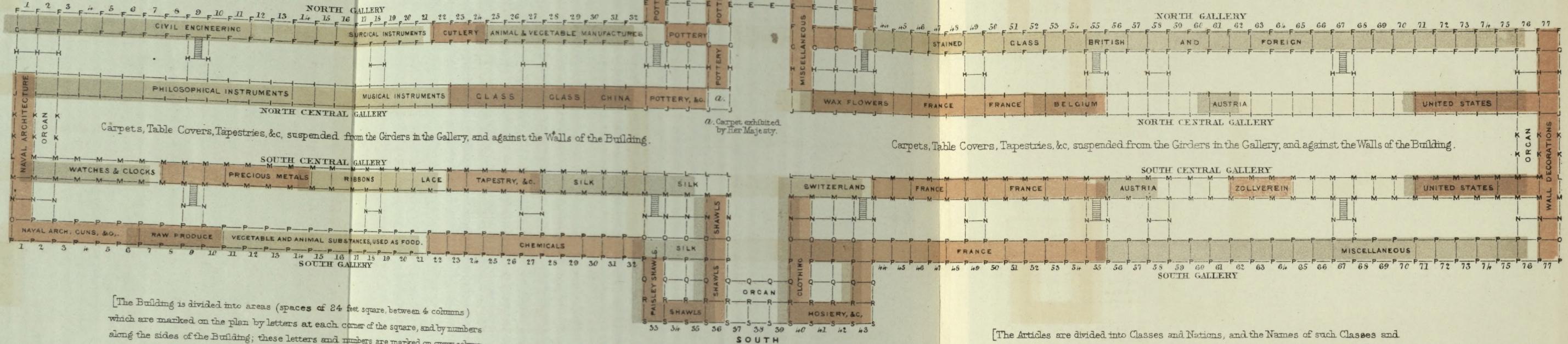
2. BAVARIA.
3. SAXONY.
4. WURTEMBERG.
5. FRANKFORT-ON-THE-MAINE.
6. HESSE-DARMSTADT, GRAND DUCHY OF.
7. LUXEMBURG.
8. NASSAU.
- GREECE.
- HAMBURGH.
- HANOVER.
- LUBECK.
- MECKLENBURG-STRELITZ.
- MECKLENBURG-SCHWERIN.
- MEXICO.
- NETHERLANDS.
- NEW GRANADA.
- OLDENBURG.
- PERSIA.
- PERU.
- PORTUGAL AND MADEIRA.
- ROME.
- RUSSIA.
- SARDINIA.
- SOCIETY ISLANDS.
- SPAIN.
- SWEDEN AND NORWAY.
- SWITZERLAND.
- TUNIS.
- TUSCANY.



DAY & SON, LITH^{RS}, TO THE QUEEN.

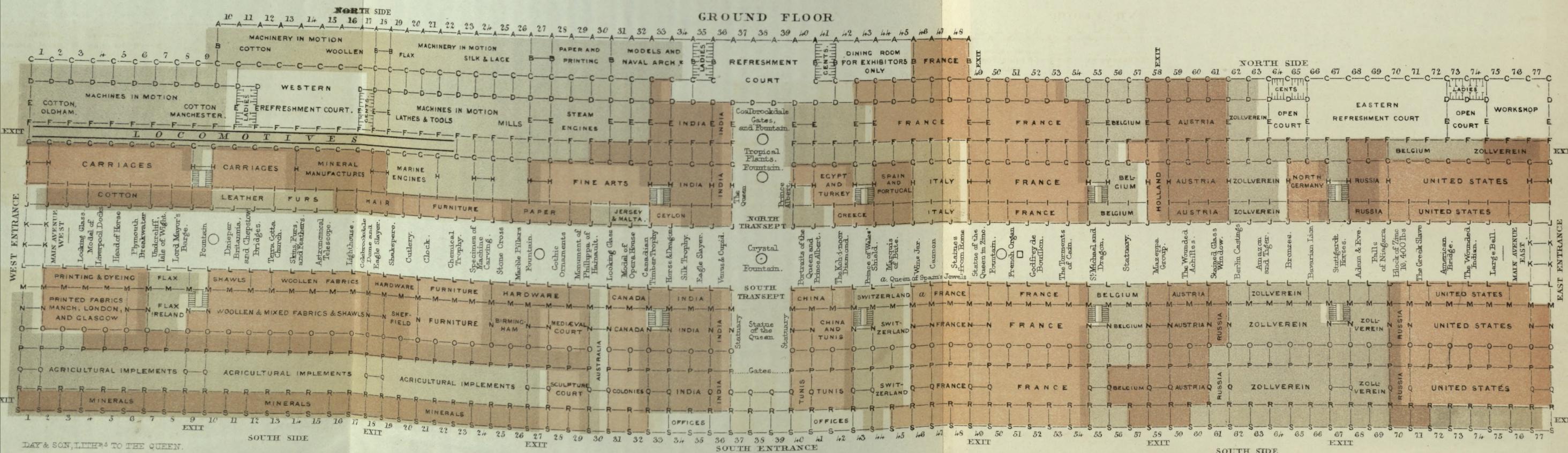
ted by His Majesty the KING of PRUSSIA to his Royal Highness the PRINCE of WALES, in commemoration of the Baptism of the Infant Prince, for whom
acted as sponsor. —— Designed by DOCTOR PETER VON CORNELIUS. —— The Architectural Ornaments, by COUNSELLOR STULER.

PLAN OF THE BUILDING



[The Building is divided into areas (spaces of 24 feet square, between 4 columns) which are marked on the plan by letters at each corner of the square, and by numbers along the sides of the Building; these letters and numbers are marked on every column in the Building in white characters at about 7 feet from the ground.]

[The Articles are divided into Classes and Nations, and the Names of such Classes and Nations are given on the Plan, and marked upon the iron girders of the Building.]



DAY & SON, LETTERS TO THE QUEEN.

Scale of 1050 10 40 30 40 50 200 180 200 Feet

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INTRODUCTION.

THE activity of the present day chiefly develops itself in commercial industry, and it is in accordance with the spirit of the age that the nations of the world have now collected together their choicest productions. It may be said without presumption, that an event like this Exhibition could not have taken place at any earlier period, and perhaps not among any other people than ourselves. The friendly confidence reposed by other nations in our institutions; the perfect security for property; the commercial freedom, and the facility of transport, which England pre-eminently possesses, may all be brought forward as causes which have operated in establishing the Exhibition in London. Great Britain offers a hospitable invitation to all the nations of the world, to collect and display the choicest fruits of their industry in her Capital; and the invitation is freely accepted by every civilized people, because the interest both of the guest and host is felt to be reciprocal.

But the consideration of the wide moral agencies which have contributed to produce the present Exhibition must be postponed, and we proceed at once to trace the course of the more direct influences which have lead to its establishment.

Fairs, which are one sort of exhibitions of works of industry, have been established for centuries, in every part of the United Kingdom; but exhibitions resembling the present institution, in which the race is for excellence, and direct commerce is not the primary object, have taken place only during the last century, and have been originated by individuals, or societies, independently of any Government assistance. As early as the years 1756-7 the Society of Arts of London offered prizes for specimens of manufactures, tapestry, carpets, porcelain, &c., and exhibited the works which were offered in competition. About the same period, the Royal Academy, as a private society, patronized by the Sovereign, more in a personal capacity than as representing the head of the Legislature, had organized its exhibitions of painting, sculpture, and engraving.

The first exhibition of industrial productions in France, recognised as a national institution, occurred in 1798, a second took place in 1801, a third in 1802, and a fourth in 1806. But it was not until the year 1819, that the expositions of French industry have taken place systematically; and it is only since that time that the influence of them has been markedly felt in Europe.

During the last thirty years, in each of the metropolitan cities of the United Kingdom, and the most important manufacturing towns, one or more exhibitions of machinery and manufactures have been held; and it may be recorded that,

Local Exhibitions
in United King-
dom.

as early as 1829, the Royal Dublin Society had founded an exhibition of works of art, science, and manufacture, to be held triennially, to which, however, Irish productions only were admitted until the year 1850. But the local exhibition of Birmingham, held in the autumn of the year 1849—originating with individuals, self-supporting in its management, and comprehensive in the scope of the objects exhibited—may be said to have most nearly resembled the Exhibition of the present year. All similar exhibitions, in fact, have been essentially of a private and local character, none of them receiving any kind of Government or national sanction, if we except the exhibition of manufactures applicable to the decoration of the Houses of Parliament, which was instituted by the Fine Arts Commissioners.

To follow the links of the chain which have connected the present Exhibition with the national sympathies and support, we must revert to the French exposition in 1844. The great success of that exposition caused several representations to be made to members of the Cabinet, of the benefit which a similar exhibition would be likely to confer on the industry of the United Kingdom, and some efforts were made to obtain the assistance of the Government, but with no apparent results. No hopes whatever were held out that the Government would undertake any pecuniary liabilities in promoting such an exhibition. It may be mentioned that, even so late as the year 1848, a proposal to establish a self-supporting exhibition of British industry, to be controlled by a Royal Commission, was submitted to HIS ROYAL HIGHNESS the PRINCE ALBERT, and by him laid before the Government; still the Government hesitated to take up the subject, and it became quite evident to those parties who were most desirous of witnessing the establishment of a national exhibition, that if such an event should ever take place, it would have to be carried out independently of any Government assistance.

It is a marking feature in all the institutions and great works of our country, that they are the consequences of popular wishes. It is not until wants become national, and that combined action becomes essential to success, that the people seek the aid of the Government. The great constitutional freedom which this country enjoys, may be ascribed in some measure to the reluctance which the Government always shows to act on behalf of the people in any case where it is possible they can act for themselves. A great part of the success which has attended the institution of this Exhibition, may be attributed to its independence of the Government; and it may be the boast of our countrymen that the Exhibition was originated, conducted, and completed independently of any Government aid whatever, except its sanction. Assistance has only been sought from the Government when it was indispensable, as in correspondence with foreign countries, the provision of a site for the building, the organization of police, &c.; and wherever such assistance, when granted, would have entailed expense, the cost of it has been defrayed from the funds of the Exhibition.

Exhibitions of the
Society of Arts.

Step by step, the subject of a national exhibition, and the means of realizing it, became connected with the Society of Arts. In June, 1845, a committee of members of that Society was formed to carry out an exhibition of national industry, and funds were subscribed by the individuals forming the committee to meet the preliminary expenses. An inquiry was set on foot to ascertain the disposition of manufacturers to support the exhibition, but the attempt failed and was abandoned. In 1847 the Council of the Society substituted action for theory, and, in the midst of discouragement, established a limited exhibition of manufactures, professedly as the beginning of a series.

The success of this exhibition determined the Council to persevere, and to hold similar exhibitions annually. Accordingly in the next year the experiment was repeated with such greatly increased success, that the Council felt warranted in announcing their intention of holding annual exhibitions, as a means of establishing a quinquennial Exhibition of British Industry, to be held in 1851. Having proceeded thus far, the Council sought to connect the Schools of Design, located in the centres of manufacturing industry, with the proposed exhibitions, and obtained the promised co-operation of the Board of Trade, through the President, Mr. LABOUCHERE; moreover, with a view to prepare a suitable building, they secured the promise of a site from the Earl of CARLISLE, then Chief Commissioner of Woods and Forests, who offered either the central area of Somerset House, or some other Government ground. In the year 1849 the exhibition, still more successful than any preceding, consisted chiefly of works in the precious metals, some of which were graciously contributed by HER MAJESTY. To aid in carrying out their intention of holding a National Exhibition in the year 1851, the Council of the Society caused a report on the French Exposition, held in 1849, to be made for them and printed. A petition was also presented by the Council to the House of Commons, praying that they might have the use of some public building for the exhibition of 1851, which was referred to the Select Committee on the School of Design.

HIS ROYAL HIGHNESS THE PRINCE ALBERT, as President of the Society, had of course been fully informed, from time to time, of all these proceedings, which had received His Royal Highness's sanction and approval; but immediately after the termination of the session of 1849, the Prince took the subject under his own personal superintendence. He proceeded to settle the general principles on which the proposed exhibition for 1851 should be conducted, and to consider the mode in which it should be carried out.

His Royal Highness has himself fully expressed the views which prompted him to take the lead in carrying out the Exhibition, and on the occasion of the banquet to promote the Exhibition, given by Mr. FARNCOMB, the Lord Mayor of London, to the municipal authorities of the United Kingdom, His Royal Highness declared these views in the following terms:—

It must, indeed, be most gratifying to me, to find that a suggestion which I had thrown out, as appearing to me of importance at this time, should have met with such universal concurrence and approbation; for this has proved to me that the view I took of the peculiar character and requirements of our age was in accordance with the feelings and opinions of the country. Gentlemen, I conceive it to be the duty of every educated person closely to watch and study the time in which he lives; and, as far as in him lies, to add his humble mite of individual exertion to further the accomplishment of what he believes Providence to have ordained. Nobody, however, who has paid any attention to the particular features of our present era, will doubt for a moment that we are living at a period of most wonderful transition, which tends rapidly to the accomplishment of that great end to which, indeed, all history points—the realization of the unity of mankind. Not a unity which breaks down the limits, and levels the peculiar characteristics of the different nations of the earth, but rather a unity the result and product of those very national varieties and antagonistic qualities. The distances which separated the different nations and parts of the globe are gradually vanishing before the achievements of modern invention, and we can traverse them with incredible ease; the languages of all nations are known, and their acquirements placed within the reach of everybody; thought is communicated with the rapidity and even by the power of lightning. On the other hand, the great principle of division of labour, which may

Enlarged by
Prince Albert.

His Royal High-
ness's views.

be called the moving power of civilization, is being extended to all branches of science, industry, and art. Whilst formerly the greatest mental energies strove at universal knowledge, and that knowledge was confined to the few, now they are directed to specialties, and in these again even to the minutest points; but the knowledge acquired becomes at once the property of the community at large. Whilst formerly discovery was wrapt in secrecy, the publicity of the present day causes that no sooner is a discovery or invention made, than it is already improved upon and surpassed by competing efforts; the products of all quarters of the globe are placed at our disposal, and we have only to choose which is the best and cheapest for our purposes, and the powers of production are intrusted to the stimulus of competition and capital. So man is approaching a more complete fulfilment of that great and sacred mission which he has to perform in this world. His reason being created after the image of God, he has to use it to discover the laws by which the Almighty governs his creation, and, by making these laws his standard of action, to conquer Nature to his use—himself a divine instrument. Science discovers these laws of power, motion, and transformation: industry applies them to the raw matter, which the earth yields us in abundance, but which becomes valuable only by knowledge: art teaches us the immutable laws of beauty and symmetry, and gives to our productions forms in accordance with them. Gentlemen,—THE EXHIBITION of 1851 is to give us a true test and a living picture of the point of development at which the whole of mankind has arrived in this great task, and a new starting point from which all nations will be able to direct their further exertions. I confidently hope the first impression which the view of this vast collection will produce upon the spectator will be that of deep thankfulness to the Almighty for the blessings which He has bestowed upon us already here below; and the second, the conviction that they can only be realized in proportion to the help which we are prepared to render to each other—therefore, only by peace, love, and ready assistance, not only between individuals, but between the nations of the earth.

On the 29th June, 1849, the general outlines of the Exhibition were discussed by His Royal Highness; and from that day to the present time, accurate accounts of all proceedings have been kept, and the greater part of them printed and published. The minutes of a meeting of several members of the Society of Arts, held at Buckingham Palace on the 30th June, set forth as follows:—

Meeting at Buckingham Palace.

His Royal Highness communicated his views regarding the formation of a Great Collection of Works of Industry and Art in London in 1851, for the purposes of exhibition, and of competition and encouragement.

His Royal Highness considered that such Collection and Exhibition should consist of the following divisions:—

Raw Materials.

Machinery and Mechanical Inventions.

Manufactures.

Sculpture and Plastic Art generally.

It was a matter of consideration whether such divisions should be made subjects of simultaneous exhibition, or be taken separately. It was ultimately settled that, on the first occasion at least, they should be simultaneous.

Various sites were suggested as most suitable for the building; which it was settled must be, on the first occasion at least, a temporary one. The Government had offered the area of Somerset House; or if that were unfit, a more suitable site on the property of the Crown. His Royal Highness pointed out the vacant ground in Hyde Park on the south side, parallel with, and between, the Kensington drive and the ride commonly called Rotten Row, as affording advantages which few other places might be found to possess. Application for this site could be made to the Crown.

It was a question whether this Exhibition should be exclusively limited to British

industry. It was considered that, whilst it appears an error to fix any limitation to the productions of machinery, science, and taste, which are of no country, but belong, as a whole, to the civilized world, particular advantage to British industry might be derived from placing it in fair competition with that of other nations.

It was further settled that, by offering very large premiums in money, sufficient inducement would be held out to the various manufacturers to produce works which, although they might not form a manufacture profitable in the general market, would, by the effort necessary for their accomplishment, permanently raise the powers of production, and improve the character of the manufacture itself.

It was settled that the best mode of carrying out the execution of these plans would be by means of a Royal Commission, of which His Royal Highness would be at the head. His Royal Highness proposed that inasmuch as the home trade of the country will be encouraged, as many questions regarding the introduction of foreign productions may arise,—in so far also as the Crown property may be affected, and Colonial products imported,—the Secretaries of State, the Chief Commissioner of Woods, and the President of the Board of Trade, should be ex-officio members of this Commission; and for the execution of its details some of the parties present, who are also members or officers of the Society of Arts, and who have been most active in originating and preparing for the execution of this plan, should be suggested as members, and that the various interests of the community also should be fully represented therein.

It was settled that a draft of the proposed Commission, grounded on precedents of other Royal Commissions, be prepared, and that information regarding the most expeditious and direct mode of doing this be procured, and privately submitted to Her Majesty's Government, in order that no time be lost in preparation for the collection when the authority of the Government shall have been obtained.

It was settled that a subscription for donations on a large scale, to carry this object into effect, would have to be organized immediately. It was suggested that the Society for Encouragement of Arts under its charter possessed machinery and an organization which might be useful, both in receiving and holding the money, and in assisting the working out of the Exposition.—(*Minutes of the Meeting on the 30th of June, 1849, at Buckingham Palace.*)

The minutes of a second meeting held on the 14th July, at Osborne, are as Meeting at Osborne follows:—

His Royal Highness stated that he had recently communicated his views regarding the formation of a great collection of works of industry and art in London in 1851, for the purpose of exhibition, and of competition and encouragement, to some of the leading statesmen, and amongst them to Sir ROBERT PEEL.

His Royal Highness judged, as the result of these communications, that the importance of the subject was fully appreciated, but that its great magnitude would necessarily require some time for maturing the plans essential to secure its complete success.

His Royal Highness communicated that he had also requested Mr. LABOUCHERE, as President of the Board of Trade, to give his consideration to this subject. Mr. LABOUCHERE was now at Osborne, and His Royal Highness expressed his desire that he should be present at this meeting. Mr. LABOUCHERE was accordingly invited to be present.

His Royal Highness gave it as his opinion that it was most important that the co-operation of the Government and sanction of the Crown should be obtained for the undertaking; but that it ought to be matter for serious consideration how that co-operation and sanction could be most expeditely given.

Mr. LABOUCHERE stated that the whole subject would have the very best consideration he could give it; and on behalf of the Ministry, he could promise an early decision as to the manner in which they could best give their co-operation.

He suggested that if, instead of a Royal Commission being formed, to include some of

the chief members of Her Majesty's Government, those same Ministers were to be elected members of a Managing Committee of the Society of Arts, this object might perhaps be as well accomplished.

It was explained to Mr. LABOUCHERE that the exertions of the Society of Arts would be given to the undertaking, to the utmost extent to which they could be useful; but that these functions would necessarily be of an executive and financial nature, rather than of a judicial and legislative character.

It was further urged by the three members of the Society, that one of the requisite conditions for the acquirement of public confidence was, that the body to be appointed for the exercise of those functions should have a sufficiently elevated position in the eyes of the public, and should be removed sufficiently high above the interests, and remote from the liability of being influenced by the feelings of competitors, to place beyond all possibility any accusation of partiality or undue influence; and that no less elevated tribunal than one appointed by the Crown, and presided over by His Royal Highness, could have that standing and weight in the country, and give that guarantee for impartiality that would command the utmost exertions of all the most eminent manufacturers at home, and particularly abroad: moreover, that the most decided mark of *national* sanction must be given to this undertaking, in order to give it the confidence, not only of all classes of our own countrymen, but also of foreigners accustomed to the expositions of their own countries, which are conducted and supported exclusively by their Governments.

It was also stated that, under such a sanction, and with such plans as now proposed, responsible parties would, it was believed and could be proved, be found ready to place at the disposal of the Commission sufficient funds to cover all preliminary expenses and the risks incidental to so great an undertaking.

Mr. LABOUCHERE expressed his sense of the great national importance of the proposal, and wished such further communication on the subject as might enable him fully to understand it, to be able better to consider the matter with his colleagues in the Cabinet.

Plan of operations.

At the same time a general outline of a plan of operations was submitted:—

I. A ROYAL COMMISSION.—For promoting Arts, Manufactures, and Industry, by means of a great Collection of Works of Art and Industry of All Nations, to be formed in London, and exhibited in 1851. President, His ROYAL HIGHNESS PRINCE ALBERT.

1. The duties and powers of the Commission to extend to the determination of the nature of the prizes, and the selection of the subjects for which they are to be offered.
2. The definition of the nature of the Exhibition, and the best manner of conducting all its proceedings.
3. The determination of the method of deciding the prizes, and the responsibility of the decision.

II. THE SOCIETY OF ARTS.—To organize the means of raising funds to be placed at the disposal of the Commission for Prizes, and to collect the funds and contributions to provide a building and defray the necessary expenses to cover the risks of the collection and exhibition; and to provide for the permanent establishment of these Quinquennial Exhibitions.

The prizes proposed to be submitted for the consideration of the Commission to be medals, with money prizes so large as to overcome the scruples and prejudices even of the largest and richest manufacturers, and ensure the greatest amount of exertion. It was proposed that the first prize should be £5,000, and that one, at least of £1,000, should be given in each of the four sections. Medals conferred by the Queen would very much enhance the value of the prizes.

Mr. LABOUCHERE finally stated that the whole matter should be carefully considered; but that there was no use in bringing it before the Cabinet at the moment of a closing session—that the Cabinet would now disperse, and not meet again till the autumn. The

interval from now to October or November might be most usefully employed by the Society in collecting more detailed evidence as to the readiness of the great manufacturing and commercial interests to subscribe to and support the undertaking, and he promised to employ that interval in further informing himself, and endeavouring to ascertain the general feeling of the country on the subject.—(*Minutes of the Meeting on the 14th of July, 1849, at Osborne.*)

On the 31st July, 1849, His Royal Highness addressed a letter to the Home Secretary, in order to bring the subject officially to the notice of Her Majesty's Government. The Prince's letter to the Home Secretary.

SIR,

Osborne, July 31, 1849.

THE Society of Arts having during several years formed exhibitions of works of national industry, which have been very successful, believe that they have thereby acquired sufficient experience, and have sufficiently prepared the public mind, to venture upon the execution of a plan they have long cherished—to invite a Quinquennial Exhibition in London of the Industry of All Nations.

They think that the only condition wanting to ensure the success of such an undertaking, would be the sanction of the Crown, given in a conspicuous manner; and they are of opinion that no more efficacious mode could be adopted than the issue of a Royal Commission to inquire into, and report upon, the practicability of the scheme, and the best mode of executing it.

I have therefore been asked, as President of the Society, to bring this matter officially before you, and to beg that Her Majesty's Government will give this subject their best consideration.

The Exhibition was proposed to be invited for 1851, and the magnitude of the necessary preliminary arrangements renders it highly desirable that the decision which the Government may have come to should be ascertained within the space of a few months.

I have, &c.,

The Right Honourable

(Signed)

ALBERT.

Sir George Grey, Bart., G.C.B.,
&c. &c. &c.

SIR,

Whitehall, August 1st, 1849.

Answer.

I HAVE had the honour to receive your Royal Highness's letter of the 31st July, suggesting the issue of a Royal Commission to inquire into, and report upon, the practicability of a scheme which has been formed by the Society of Arts for a Quinquennial Exhibition in London of the Industry of all Nations.

I shall not fail, in obedience to your Royal Highness's command, to take an early opportunity of bringing this important subject under the consideration of Her Majesty's Government, and I am confident that it will receive their careful and deliberate attention.

I have, &c.,

(Signed)

G. GREY.

To His Royal Highness Prince Albert, K.G.

(*Minutes of the Meeting on the 3rd of September, 1849, at Balmoral.*)

In this stage of the proceeding it became necessary to place the accomplishment of the undertaking, as far as possible, beyond a doubt. Having acquired experience, in 1845, of the difficulties to be encountered, the Council of the Society of Arts felt that the proposal must not be brought a second time before the public as an hypothesis, but that the only means of succeeding was to prove that they had both the will and the power to carry out the Exhibition. The Society had no funds of its own available for the advances necessary to be made. The outlay for a Pecuniary arrangements to insure execution of the proposal.

building upon the scale then thought of, and for preliminary expenses, was estimated at the least at £70,000.

After much fruitless negotiation with several builders and contractors, an agreement was made between the Society of Arts and the Messrs. MUNDAY, by which the latter undertook to deposit £20,000 as a prize fund, to erect a suitable building, to find offices, to advance the money requisite for all preliminary expenses, and to take the whole risk of loss on certain conditions. It was proposed that the receipts arising from the Exhibition should be dealt with as follows:—The £20,000 prize fund, the cost of the building, and five per cent. on all advances, were to be repaid in the first instance: the residue was then to be divided into three equal parts; one part was to be paid at once to the Society of Arts as a fund for future exhibitions; out of the other two parts all other incidental costs, such as those of general management, preliminary expenses, &c., were to be paid; and the residue, if any, was to be the remuneration of the contractors, for their outlay, trouble, and risk. Subsequently the contractors agreed that instead of this division they would be content to receive such part of the surplus, if any, as, after payment of all expenses, might be awarded by arbitration. This contract was made on 23rd August, 1849, but the deeds were not signed until the 7th November following.

For the purpose of carrying the contract into execution on behalf of the Society, the Council nominated an Executive Committee of four members, who were afterwards appointed the Executive in the Royal Commission, and the contractors their own nominee. In thus making the contract with private parties for the execution of what, in fact, would become a national object, if the proposal should be entertained by the public, every care was taken to anticipate the public wishes, and to provide for the public interests. It was foreseen that if the public identified itself with the Exhibition, they would certainly prefer not to be indebted to private enterprise and capital for carrying it out. A provision was made with the contractors to meet this probability, by which it was agreed, that if the Treasury were willing to take the place of the contractors, and pay the liabilities incurred, the Society of Arts should have the power of determining the contract before the 1st February, 1850. In the event of an exercise of this power the compensation to be paid to the Messrs. MUNDAY for their outlay and the risk was to be settled by arbitration.

The Society of Arts having thus secured the performance of the pecuniary part of the undertaking, the next step taken was to ascertain the readiness of the public to promote the Exhibition. It has been shown that the proof of this readiness would materially influence Her Majesty's Government in consenting to the proposal to issue a Royal Commission to superintend the Exhibition. The Prince ALBERT, as President of the Society of Arts, therefore commissioned several members of the Society, in the autumn of 1849, to proceed to the “manufacturing districts of the country, in order to collect the opinions of the leading manufacturers, and further evidence with reference to a Great Exhibition of the Industry of all Nations to be held in London in the year 1851, in order that His Royal Highness might bring the results before Her Majesty's Government.” Commissioners were appointed, visits made, and reports of the results submitted to the Prince, from which it appeared that 65 places, comprehending the most important cities and towns of the United Kingdom, had been visited. Public meetings had been held, and local committees of assistance formed in them.

It further appeared that nearly 5000 influential persons had registered themselves as promoters of the proposed Exhibition.

Upon the presentation of these reports to Her Majesty's Government, the Queen was pleased to issue the following Commission, which was published in the London Gazette of 3rd January, 1850:—

VICTORIA, R.

VICTORIA, by the grace of God, of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith: To Our most dearly-beloved Consort His Royal Highness FRANCIS ALBERT AUGUSTUS CHARLES EMANUEL, Duke of SAXONY, Prince of Saxe-COBURG AND GOTHA, Knight of Our Most Noble Order of the Garter, and Field-Marshal in Our army;—Our right trusty and right entirely well-beloved cousin and Councillor WALTER FRANCIS Duke of BUCCLEUCH AND QUEENSBERRY, Knight of Our Most Noble Order of the Garter; Our right trusty and right well-beloved cousin WILLIAM Earl of ROSSE, Knight of Our Most Illustrious Order of St. Patrick; Our right trusty and right-well beloved cousins and Councillors, GRANVILLE GEORGE Earl GRANVILLE, and FRANCIS Earl of ELLESMORE; Our right trusty and well-beloved Councillor EDWARD GEOFFREY Lord STANLEY; Our right trusty and well-beloved Councillors, JOHN RUSSELL (commonly called Lord JOHN RUSSELL), Sir ROBERT PEEL, Baronet, HENRY LABOUCHERE, and WILLIAM EWART GLADSTONE; Our trusty and well-beloved Sir ARCHIBALD GALLOWAY, Knight Commander of Our Most Honourable Order of the Bath, and Major-General in Our Army in the East Indies, Chairman of the Court of Directors of the East India Company,* or the Chairman of the Court of Directors of the East India Company for the time being; Sir RICHARD WESTMACOTT, Knight; Sir CHARLES LYELL, Knight, President of the Geological Society of London, or the President of the Geological Society of London for the time being;† THOMAS BARING, Esquire; CHARLES BARRY, Esquire; THOMAS BAZLEY, Esquire; RICHARD COBDEN, Esquire; WILLIAM CUBITT, Esquire, President of the Institution of Civil Engineers, or the President of the Institution of Civil Engineers for the time being; CHARLES LOCK EASTLAKE, Esquire;‡ THOMAS FIELD GIBSON, Esquire; JOHN GOTTF, Esquire; SAMUEL JONES LOYD, Esquire;§ PHILIP PUSEY, Esquire; and WILLIAM THOMPSON, Esquire, greeting:

WHEREAS the Society for the Promotion of Arts, Manufactures, and Commerce, incorporated by Our Royal Charter, of which Our most dearly-beloved Consort the Prince ALBERT is President, have of late years instituted Annual Exhibitions of the Works of British Art and Industry, and have proposed to establish an enlarged Exhibition of the Works of Industry of all Nations, to be holden in London in the year 1851, at which Prizes and Medals, to the value of at least Twenty Thousand Pounds Sterling, shall be awarded to the Exhibitors of the most meritorious works then brought forward; and have invested in the Names of Our right trusty and entirely beloved cousin SPENCER JOSHUA ALWYNE Marquess of Northampton; Our right trusty and right well-beloved cousin and Councillor GEORGE WILLIAM FREDERICK Earl of CLARENDON, Knight of Our Most Noble Order of the Garter; Our trusty and well-beloved Sir JOHN PETER BOILEAU, Baronet, and JAMES COURTHOPE PEACHE, Esquire, the sum of Twenty Thousand Pounds, to be awarded in Prizes and Medals as aforesaid: and have appointed our trusty and well-beloved ARTHUR KETT BARCLAY, Esquire, WILLIAM COTTON, Esquire, Sir JOHN WILLIAM LUBBOCK, Baronet, SAMUEL MORTON PETO, Esquire, and Baron LIONEL DE ROTHSCHILD, to be the

* At his death in 1850, he was succeeded by JOHN SHEPHERD, Esq.

† Succeeded by WILLIAM HOPKINS, Esquire, M.A., Cambridge, though Sir C. LYELL still remains a Commissioner by election under the Royal Charter afterwards granted.

‡ Now Sir C. L. EASTLAKE, President of the Royal Academy.

§ Now Baron OVERSTONE.

Treasurers for all Receipts arising from donations, subscriptions, or any other source on behalf of or towards the said Exhibition; Our trusty and well-beloved PETER LE NEVE FOSTER, JOSEPH PAYNE, and THOMAS WINKWORTH, Esquires, to be the Treasurers for payment of all Executive Expenses; and Our trusty and well-beloved HENRY COLE, CHARLES WENTWORTH DILKE, the younger, GEORGE DREW, FRANCIS FULLER, and ROBERT STEPHENSON, Esquires, with our trusty and well-beloved MATTHEW DIGBY WYATT, Esquire, as their Secretary, to be an Executive Committee for carrying the said Exhibition into effect, under the directions of Our most dearly beloved Consort:

AND whereas the said Society for the Promotion of Arts, Manufactures, and Commerce, have represented unto Us, that in carrying out the objects proposed by the said Exhibition, many questions may arise regarding the introduction of productions into Our kingdom from Our Colonies, and from Foreign Countries; also regarding the site for the said Exhibition; and the best mode of conducting the said Exhibition; likewise regarding the determination of the nature of the Prizes, and the means of securing the most impartial distribution of them; and have also besought Us that We would be graciously pleased to give Our sanction to this undertaking, in order that it may have the confidence, not only of all classes of Our subjects, but of the subjects of Foreign Countries:

NOW KNOW YOU THAT WE, considering the premises, and earnestly desiring to promote the proposed Exhibition, which is calculated to be of great benefit to Arts, Agriculture, Manufactures, and Commerce, and reposing great trust and confidence in your fidelity, discretion, and integrity, have authorized and appointed, and by these presents do authorize and appoint you, Our most dearly beloved Consort FRANCIS ALBERT EMANUEL Duke of SAXONY, Prince of SAXE-COBOURG AND GOTHA, you WALTER FRANCIS DUKE of BUCKLEUCH AND QUEENSBERRY; WILLIAM Earl of ROSSE; GRANVILLE GEORGE Earl GRANVILLE; FRANCIS Earl of ELLESMORE; EDWARD GEOFFREY Lord STANLEY; JOHN RUSSELL (commonly called Lord JOHN RUSSELL), Sir ROBERT PEEL, HENRY LABOUCHERE, WILLIAM EWART GLADSTONE, Sir ARCHIBALD GALLOWAY, or the Chairman of the Court of Directors of the East India Company for the time being, Sir RICHARD WESTMACOTT, Sir CHARLES LYELL, or the President of the Geological Society for the time being, THOMAS BARING, CHARLES BARRY, THOMAS BAZLEY, RICHARD COBDEN, WILLIAM CUBITT, or the President of the Institution of Civil Engineers for the time being, CHARLES LOCK EASTLAKE, THOMAS FIELD GIBSON, JOHN GOT, SAMUEL JONES LOYD, PHILIP PUSEY, and WILLIAM THOMPSON, to make full and diligent inquiry,—into the best mode by which the productions of Our Colonies and of Foreign Countries may be introduced into Our kingdom;—as respects the most suitable site for the said Exhibition,—the general conduct of the said Exhibition;—and also into the best mode of determining the nature of the Prizes, and of securing the most impartial distribution of them:

AND to the end that Our Royal Will and Pleasure in the said inquiry may be duly prosecuted, and with expedition, WE FURTHER, BY THESE PRESENTS, WILL AND COMMAND, and do hereby give full power and authority to you, or any three or more of you, to nominate and appoint such several persons of ability as you may think fit to be Local Commissioners, in such parts of Our kingdom and in Foreign parts as you may think fit, to aid you in the premises; which said Local Commissioners, or any of them, shall and may be removed by you, or any three or more of you, from time to time, at your will and pleasure, full power and authority being hereby given to you, or any three or more of you, to appoint others in their places respectively.

AND FURTHERMORE, We do, by these Presents, give and grant to you, or any three or more of you, full power and authority to call before you, or any three or more of you, all such persons as you shall judge necessary, by whom you may be the better informed of the truth of the premises, and to inquire of the premises, and every part thereof, by all other lawful ways and means whatsoever.

AND OUR FURTHER WILL AND PLEASURE IS, That for the purpose of aiding you in the execution of these premises, We hereby appoint Our trusty and well-beloved JOHN SCOTT

RUSSELL and STAFFORD HENRY NORTHCOTE,* Esquires, to be joint Secretaries to this Our Commission.

AND for carrying into effect what you shall direct to be done in respect of the said Exhibition, We hereby appoint the said HENRY COLE, CHARLES WENTWORTH DILKE the younger, GEORGE DREW, FRANCIS FULLER, and ROBERT STEPHENSON, to be the Executive Committee in the premises, and MATTHEW DIGBY WYATT to be the Secretary of the said Executive Committee.

AND OUR FURTHER WILL AND PLEASURE IS, That you, or any three or more of you, when and so often as need or occasion shall require, so long as this Our Commission shall continue in force, do report to Us in writing, under your hands and seals respectively, all and every of the several proceedings of yourselves had by virtue of these presents, together with such other matters, if any, as may be deserving of Our Royal consideration touching or concerning the premises.

AND LASTLY, WE DO BY THESE PRESENTS ORDAIN, That this Our Commission shall continue in full force and virtue, and that you Our said Commissioners, or any three or more of you, shall and may, from time to time, and at any place or places, proceed in the execution thereof, and of every matter and thing therein contained, although the same be not continued from time to time by adjournment.

Given at Our Court at St. James's, the 3rd day of January,
in the 13th year of Our reign.

By Her Majesty's Command,
G. GREY.

The foresight of the Society of Arts, which had provided a mode by which the contract might be determined in conformity with the public wishes, was fully justified by the event. So far as the public manifested its opinion it appeared to be its wish that the undertaking should be carried out as a national work. Accordingly at the first meeting of the Commissioners, held on 11th January, 1850, the propriety of confirming the contract was discussed, and they resolved to avail themselves of the powers which the Council of the Society of Arts had reserved. The first act of the Commissioners was the publication of the following announcement:—

The Royal Commissioners have felt it their duty, at this their first meeting, to take into their immediate consideration the propriety of confirming the Contract which has been entered into with Messrs. MUNDAY.

They are perfectly satisfied that the contract was framed with the sole desire on the part of the Society of Arts of promoting the objects of the Commission,—that in agreeing to it at a time when the success of the scheme was necessarily still doubtful, the Messrs. MUNDAY evinced a most liberal spirit,—that it has hitherto afforded the means of defraying all the preliminary expenses,—and that its conditions are strictly reasonable, and even favourable to the public.

After hearing, however, the statements made by individual members of the Commission,—after communicating with the Executive Committee,—and after a full consideration of the whole subject,—the Commissioners have come to the conclusion that it will be more consonant with the public feeling, and therefore more conducive to the objects for which the Commission has been appointed, to exercise the power reserved, and at once and absolutely to terminate the contract with the Messrs. MUNDAY.

This determination necessarily throws the whole burden of the Exhibition upon voluntary contributions. The experiment is of a national character, and the Commissioners feel that it ought to rest for its support upon national sympathies, and upon such liberal contributions as those sympathies may dictate.

Determination of
the Contract with
the Society of
Arts.

* Now Sir STAFFORD H. NORTHCOTE, Bart.

The amount of the funds which the public may place at the disposal of the Commissioners must determine the extent of accommodation which can be provided for the Exhibitors, and the terms on which admission can be given to the articles to be exhibited, and upon which also the public can be admitted to inspect them.

The Commissioners wish it to be understood that they are invested with unrestricted power over the application of the funds; that it is their intention to invite competition in respect of all branches of expenditure to which competition can advantageously be applied; and that they will proceed, without delay, to establish regulations for insuring an effectual control over the expenditure, and a satisfactory audit of the accounts.

The Commissioners feel, that in thus abandoning a contract which, regarded in a pecuniary point of view alone, is undoubtedly advantageous to the public, and resting the success of the proposed experiment entirely upon public sympathy, they have adopted a course in harmony with the general feelings of the community.

It now rests with the public to determine, by the amount of their contributions, the character of the proposed Exhibition, and the extent of benefit to industry in all its branches which will result from it.

It is desirable that subscriptions for this great purpose be immediately commenced throughout the United Kingdom, and the result ascertained with the least possible delay.

In the mean time the Commissioners will be actively engaged in preparing the various measures, upon which it will be their duty to come to a final decision as soon as they are enabled definitely to ascertain the extent of the pecuniary means which will be placed at their disposal.

It is desirable, before giving any account of the proceedings under the Commission, to notice those changes which necessarily supervened upon the determination of the contract. The Commission itself set forth that the functions of the Commissioners were those of inquiry and general direction, whilst all the pecuniary responsibilities, and the performance of all the executive duties, were to be carried out by and in the name of the Society of Arts; but when the contract was cancelled, although the Commission itself was not altered, the practical result was to place on the Commissioners individually and personally the whole responsibility of the undertaking, both pecuniary and executive. Under these circumstances the Executive Committee felt it to be their duty to tender their resignations (*Min. iv., p. 3*), which they did in the following terms:—

The members of the Executive Committee submit that the dissolution by the Royal Commission of the contract, which they had been appointed for the purpose of carrying out, has changed the nature of their functions, and even superseded many of them. They are of opinion, therefore, that it is desirable that the Royal Commission should be left as free to select the best organization for carrying their intentions into effect, as if the Executive Committee had never been appointed. They feel that they should not be acting in accordance with their sincere wishes of witnessing the perfect success of the Exhibition, if they did not come forward to express their entire readiness at once to place their position in the hands of HIS ROYAL HIGHNESS THE PRINCE ALBERT, and the Royal Commissioners.

These resignations were not accepted, and some time elapsed before the executive arrangements were conclusively modified to meet the altered circumstances of the case. It had been the original intention of the Society of Arts in forming the contract, that in the event of its being determined, the liabilities of the contractors should be simply transferred to the Government, and that the original relations between the Commissioners and the Society of Arts should have remained; but this intention does not seem to have been made sufficiently clear by the deed, and it was not urged by the Society of Arts. The deed of

contract simply provided that the Treasury should have power to undertake the liabilities and relieve the Society of Arts from them. This the Treasury did, but in doing so, at the same time took a guarantee from the Commissioners themselves, and thus the whole responsibilities rested with them. The answer of the Treasury to the Commissioners was that—

My lords have no intention of rendering themselves liable to the payment of any sum on this account; but as it seems that a request from them, that the contract should be determined, is necessary in order to enable the Commissioners to carry out their own intentions, they have no objection to taking the formal step of making the request suggested by the Commissioners to the Council of the Society of Arts, on receiving from the Commissioners an undertaking that the money will be forthcoming when required by Messrs. MUNDAY in conformity with the stipulations of the contract.

The Commissioners accordingly undertook that the money should be forthcoming when required (*Min. iii.*, p 7). The Society of Arts gave the requisite notices to the Messrs. MUNDAY, and in due time all the outlay which they had made, amounting to about £23,000, with the interest which had accrued, was repaid to them.

The pecuniary liabilities having thus devolved wholly on the Commissioners, it became natural that they should desire to appoint a chief executive officer of their own nomination. HER MAJESTY was advised to issue supplemental commissions, appointing Mr. ROBERT STEPHENSON, M.P., a commissioner, upon his resignation as Chairman of the Executive Committee, and Lieutenant-Colonel W. REID, R.E., Chairman of the Executive Committee in his place. These appointments were made by the advice of the Government, Mr. LABOUCHERE stating, “that the subject of the executive arrangements had been under their consideration, and that they had proposed to recommend to HER MAJESTY to appoint Colonel REID to be Chairman of the Executive Committee” (*Min. v.*, p. 1). The contractors themselves, as well as their nominee, thereupon ceased to attend the meetings of the Executive Committee.

The earliest step which the Commissioners took after the determination of the contract was to appeal to the country for subscriptions to carry out the Exhibition. They announced that they had undertaken the absolute control over the expenditure of all money that might come into the hands of their Treasurers, and had made arrangements for auditing accounts, and ensuring the strictest economy. It was pointed out that the scale upon which this important undertaking would be conducted must depend entirely on the amount of pecuniary support which it should receive from the public. The Commissioners appealed with confidence to all classes of the community, to enable them to make such liberal arrangements as would ensure the success of the undertaking in a manner worthy of the character and position of this country, and of the invitation which had been given to the other nations of the world to compete with us in a spirit of generous and friendly emulation. It was announced that the amount of the funds which the public might place at the disposal of the Commissioners must determine the extent of accommodation which could be provided for the Exhibition; and that should any surplus remain, after giving every facility to the exhibitors, and increasing the privileges of the public as spectators, Her Majesty's Commissioners intended to apply the same to purposes strictly in connection with the ends of the Exhibition, or for the establishment of similar exhibitions for the future.

All subscriptions were considered to be absolute and definite; they were paid

Mutual liabilities
of the Treasury
and the Com-
missioners.

Public Subscrip-
tions and financial
management.

to the Treasurers of Local Committees, and by them transferred to the general fund at the Bank of England, in the names of the Treasurers named in the Royal Commission. An Appendix to this introduction shows that the gross amount of subscriptions reported as having been received has amounted to £75,000. Of this above £64,000 has been paid to the Commissioners, the balance having been reserved by the Local Committees to meet the expenses of collection, printing, &c. The general financial position of the undertaking at the opening of the Exhibition was as follows:—

<i>Receipts.</i>	<i>£.</i>	<i>Expenditure and Liabilities.</i>	<i>£.</i>
Subscriptions paid to April 22 .	64,344	Building	79,800
For privilege to print the Cata- logues	3,200	Extra Galleries, Counters, and their fittings, estimated at .	35,000
For privilege to sell Refresh- ments	5,500	By Prize Fund	20,000
By Season Tickets to April 29	40,000	Management, including Print- ing and all Incidental Ex- penses incurred up to April	20,943
Admissions of the Public . . .		Management during the Exhi- bition	
Royalty on sale of 1s. Catalogue			

Subject to the approval of the Commissioners the direct control over this expenditure has been exercised by a Finance Committee, consisting of Lord GRANVILLE (Chairman), Lord OVERSTONE, Mr. LABOUCHERE, Mr. GLADSTONE, Sir ALEXANDER SPEARMAN, Mr. T. F. GIBSON, Mr. T. BARING, Mr. COBDEN, and Mr. PETO. Mr. EDGAR A. BOWRING has acted as Secretary to the Committee, and Assistant Commissary-General CARPENTER, as the financial officer, has administered the actual expenditure of the Commission.

The preceding statement of account shows that, even at the present time, a considerable liability has been incurred by the Commissioners. At the period when it became necessary to make positive arrangements for the erection of the building, the actual receipts were only £35,000: personal responsibility legally attached to His Royal Highness the President, and to every member of the Royal Commission, in respect of every pecuniary engagement. A remedy for this somewhat anomalous position was obtained by means of a charter of incorporation, and the formation of a guarantee fund. The first relieved the Commissioners of all personal responsibility, and the second insured both the completion of the undertaking, and the House of Commons from the liability of being required to make any grant of the national funds towards it.

Charter of Incorporation. Letters Patent, dated July, 1850, were issued, incorporating the Commissioners, under the title of "The Commissioners for the Exhibition of 1851," and the charter was accepted 15th August, 1850 (*Min. xxviii.*, p. 1). A guarantee fund of £230,000 was formed by a limited number of persons, including most of the Commissioners, and other friends of the Exhibition, one of whom opened the list with a subscription of £50,000: upon the security of this fund the Bank of England consented to make such advances of money as might be wanted from time to time.

General principles of the Exhibition. The fundamental principles upon which it was proposed the Exhibition should be formed had been discussed and settled before the Commission was issued, and are recited in the Commission itself. With the requisite limitations and conditions, these principles were confirmed by the Commissioners, and formally announced in the month of February, 1850, so that there was a full year for preparations. It was declared that the productions of all nations would be

admitted, and classified lists of objects were prepared by Committees of eminent persons in each department (whose names are given in an Appendix), and published to show the nature of the contributions which exhibitors were invited to send in the four departments of RAW MATERIALS and PRODUCE, MACHINERY, MANUFACTURES, and FINE ARTS. The regulations by which certain articles were excluded were as follows:—

Nothing is suitable for the Exhibition, except such results of human industry as are capable of being preserved without injury during many months.

All spirits, wines, and fermented liquors, unless derived from unusual sources, are inadmissible, except in special cases, and under special restrictions; and when oils, spirits, &c., are exhibited, to prevent accidents, they must be shown in well-secured glass vessels.

All highly-inflammable articles, such as gunpowder, detonating powder, lucifer matches, &c., and all live stock, and articles perishable within the duration of the Exhibition, are inadmissible, unless specially excepted.

In respect of the fourth section of the Exhibition, SCULPTURE, MODELS, and the PLASTIC ART, the following were the limitations:—

Objects formed in any kind of material, if they exhibit such a degree of taste and skill as to come under the denomination of *Fine Art*, may be admitted into this section.

The specimens exhibited shall be works of living artists, or works of artists deceased within three years before the 1st of January, 1851.

Oil paintings and water-colour paintings, frescoes, drawings, and engravings, are not to be admitted, except as illustrations or examples of materials and processes; and portrait busts are not to be admitted.

No single artist will be allowed to exhibit more than three works.

It was also announced that the 1st day of May, 1851, was fixed for opening the Exhibition, and the engagement has been kept: that Her Majesty had been graciously pleased to grant a site for the Exhibition on the south side of Hyde Park, lying between the Kensington Drive and the Ride commonly called Rotten Row, and that exhibitors would be required to deliver their objects, at their own charge and risk, at the building, which would be provided to them free from rent.

After much examination and inquiry, the Commissioners resolved that prices were not to be affixed to the articles exhibited, although the articles might be marked as shown for economy of production, and the price stated in an invoice to be sent to the Commissioners for the information of the Juries.

It was clear that two very different systems of management would necessarily have to be adopted towards Foreign countries and the United Kingdom, arising out of the different relations of guest and host. Although it was proposed that the expenses of the building and management should be defrayed by voluntary subscriptions, scrupulous care was taken on every occasion to discourage the receipt of any subscription from any foreigner, resident at home or abroad. Over the admission of British articles, the Commissioners reserved to themselves full powers of control; but as respects Foreign articles, the power of admitting them was confided absolutely to an authority of the country which sent them.

In order to give Foreign countries the utmost time for their preparations, and long before the size or character of the building had been determined, the Commissioners resolved to divide a certain large amount of exhibiting space among all Foreign countries, amounting in the whole to above 210,000 superficial

Opening fixed for
May 1, 1851.

Admission of Foreign articles.

feet, or rather more than the entire space which France occupied for its two expositions of 1844 and 1849. It was estimated that this amount would be about half the size of the building, which was considered to be a fair proportion.

Space offered to Foreign countries The amount of space which was offered to each Foreign country, and placed at its absolute disposal, was as follows:—

	Net superficial Feet allotted.		Net superficial Feet allotted.
Arabia	500	Italy—	
Belgium	15,000	Naples	2,500
Bolivia	100	Rome	1,000
Brazil	1,000	Sardinia	1,500
Buenos Ayres	500	Tuscany	3,750
Central America	300	Mexico	1,000
Chili	500	Monte Video	100
China	2,500	Morocco	500
Denmark	2,500	New Granada	500
Egypt	1,500	Norway and Sweden	2,500
Equator	100	Persia	500
France	50,000	Peru	500
Germany—		Portugal	1,000
Austria	21,750	Russia	7,500
Northern Germany—		Spain	2,500
States of the Stuerverein . . .	2,250	Switzerland	4,000
The Two Mecklenbergs . . .	1,250	Tunis	500
Hanse Towns	1,500	Turkey	5,000
Zollverein	30,000	United States	40,000
Greece	1,000	Venezuela	400
Holland	5,000	Western Africa	500
		Total	213,000

Subsequently these amounts were increased in several instances. France, for example, obtained upwards of 65,000 superficial feet of exhibiting space, instead of only 50,000 feet.

Accompanying the allotment of space sent to each Foreign country and colony, the following instructions were transmitted:—

No articles of foreign manufacture, to whomsoever they may belong, or wheresoever they may be, can be admitted for exhibition, *unless they come with the sanction of the central authority of the country of which they are the produce.* All articles forwarded by such central authority will then be admitted, provided they do not require a greater aggregate amount of space than that assigned to the productions of the country from which they come; and, provided also, that they do not violate the general conditions and limitations. It will rest with the central authority in each country to decide upon the merits of the several articles presented for exhibition, and to take care that those which are sent are such as fairly represent the industry of their fellow countrymen.

Her Majesty's Commissioners will consider that to be the central authority in each case which is stated to be so by the Government of its country. Having once been put in communication with a central authority in any country, they must decline, absolutely and entirely, any communication with private and unauthorized individuals; and should any such be addressed to them, they can only refer it to the central body. This decision is essentially necessary, in order to prevent confusion.

The Commissioners do not insist upon articles being in all cases actually forwarded by the central authority, though they consider that this would generally be the most satisfactory

arrangement; but it is indispensable that the sanction of such authority should in all cases be expressly given, and that it be held responsible for the fitness of such articles for exhibition, and for not authorizing the exhibition of a greater quantity than can be accommodated in the space assigned to the productions of the country in question.

In case the central authority in any country should be of opinion that the space allotted to the productions of that country is greater than it will require, the Commissioners have to request that this opinion may be communicated to them, as it is obvious that it would not appear well if a large vacant space should be left in the department assigned to any country.

A definite quantity of space was in like manner offered to each of the British <sup>And British Co-
lonies.</sup> Colonies in the following proportions, and subject to the same rules for admission:

	Net superficial Feet allotted.		Net superficial Feet allotted.
Australian Colonies—			
New South Wales	2,000	Nova Scotia and Cape Breton	1,000
New Zealand	500	Prince Edward's Island	250
South Australia	350	St. Helena	50
Van Diemen's Land	600	Sierra Leone	150
West Australia	350	West India Colonies—	
Bermudas	50	Antigua	375
Canada	4,000	Bahamas	100
Cape of Good Hope and Natal	750	Barbadoes	750
Cape Coast Castle and Dependencies	100	British Guiana	100
Ceylon	1,500	Dominica	125
Falkland Islands	25	Granada	250
Gambia	100	Jamaica	1,500
Gibraltar	100	Montserrat	50
Hong Kong	Nil.	Nevis	100
Hudson's Bay Co.'s Territories	1,000	St. Christopher's	250
India, including Singapore	30,000	St. Lucia	250
Ionian Islands	1,000	St. Vincent	250
Labuan	250	Tobago	100
Malta	1,000	Tortola and Virgin Islands	50
Mauritius	750	Trinidad	750
New Brunswick	750		
Newfoundland	500	Total.	51,025

It was intimated that colonial and foreign productions would be admitted for the purposes of exhibition without payment of duty. The building of the Exhibition has been considered as a bonded warehouse, and the Commissioners of Customs have afforded the utmost facilities consistently with that obedience to Customs' laws, which was imperative.

Those who have had experience only of the continental systems of exhibitions, which are managed and paid for wholly by their Governments, find it difficult to understand the self-supporting and self-acting principle of the present Exhibition, which has hitherto depended wholly upon the voluntary subscriptions of the British people: the heavy liabilities which still hang over the undertaking rest wholly upon individuals in their private capacity, and not upon the Government. The British people, as well poor and working men, as the richer classes, have had the undivided responsibility, not only of conducting the first experiment of an Exhibition of their own works on a national scale, but of collecting funds to pay all the expenses of an Exhibition of the Works of all Nations. Our National Exchequer has not been charged with any portion of the expenses, but the con-

*Self-supporting
principle of the
Exhibition.*

tributions of the most remote towns have been received and applied, even in payment of the military and police assistance which the Government has permitted to be employed on the occasion. So completely spontaneous has been the organization for the Exhibition, that not even the several municipal councils throughout the country were employed, but an independent organization was created for the express purpose wherever a locality was disposed to form its own Local Committee. Without the assistance of the Local Committees of the United Kingdom, no Exhibition of the Works of Industry of all Nations could ever have been accomplished.

Local Committees of the United Kingdom.

About 65 Local Committees had been formed before the issue of the Royal Commission, with the assistance of the Members of the Society of Arts, who had been nominated by the President to visit different parts of the kingdom. To extend this organization over the whole kingdom, into Local Committees, was one of the first acts of the Royal Commission. A circular was issued to the Mayors of all towns within the United Kingdom, having a municipal constitution (*Min. i.*, p. 1), announcing the issue of the Royal Commission, and requesting, if no Local Committee had been formed, that the mayor would communicate with the principal inhabitants for the purpose of ascertaining whether, in their opinion, the circumstances of the town rendered it advisable to appoint a Local Committee. The functions of these Local Committees have chiefly consisted in the recommendation of Local Commissioners to represent the interests of their localities—in encouraging the production of suitable objects for exhibition—in affording information in the locality relative to the Exhibition—in the collection of subscriptions—and in facilitating the means of visiting the Exhibition.

The Commissioners intimated that it was their wish to limit, as far as possible, the necessity for the exercise of the powers of rejection and selection of objects intended for exhibition, and for that purpose to call to their assistance the local knowledge and discretion of the several Local Committees. They recommended that the Local Committees should enter into personal communication with those persons resident within their district, who were likely to be exhibitors; and that they should ascertain the character and number of the objects which it would be their wish to send to the Exhibition. For the purpose of communicating with the Local Committees, the Commissioners appointed Dr. LYON PLAYFAIR, and Lieut.-Colonel LLOYD, Surveyor-General of the Mauritius, Special Commissioners.

Demand for space by British exhibitors.

It was not required that exhibitors should of necessity be subscribers to the fund. All persons desirous of contributing articles to the Exhibition of 1851, were invited to give notice of such intention, and transmit a general description of the nature of each article, and the space which would be required for the exhibition of it, to the Secretary of the nearest Local Committee, and the Local Committee was requested to digest the returns so made to them, and transmit them to the Commission before the 31st Oct., 1850. It was not necessary in the first instance either to exhibit to the Local Committee specimens of the articles to be sent, or to give a minute specification of them. But it was decided that it was necessary for intending exhibitors to obtain the certificate of the nearest Local Committee, of its approval of the articles sent for exhibition, before they could be received by the Commissioners in the building. Upwards of 330 Local Committees were formed in the three parts of the United Kingdom and the Channel Isles. A list of those which have transmitted subscriptions to the fund, or sent articles to the Exhibition, will be found in the Appendix.

The 31st October was appointed the last day when the Local Committees were required to transmit to the Executive Committee the demands for space which intending exhibitors had made through them.

It then appeared that the whole of the demands for horizontal (floor and counter) space in the building which the Local Committees of the United Kingdom returned, exceeded 417,000 superficial feet of exhibiting space, being in excess of the amount of available space for the United Kingdom by about 210,000 superficial feet. The amount of vertical or wall space demanded was only 200,000 superficial feet. The number of persons who proposed to exhibit was upwards of 8,200.

Upon the receipt of these data the Commissioners proceeded to adjust the proportions of floor or counter space which it appeared desirable that the four sections of the Exhibition should occupy in the Building. Upon averages, furnished by the whole of the United Kingdom, and obtained by dividing the total amount of space apportioned to each section by the number of exhibitors in that section, the Commissioners, as a general rule, allotted to each Local Committee an amount of space in each section, in proportion to the number of exhibitors which had been returned by each Committee. The Commissioners left the allotment of space to each exhibitor absolutely to the discretion of each Local Committee. They desired that each Local Committee, in allotting space to the individual exhibitors, should, as far as possible, maintain the proportions of the four sections allotted to it, so that in the ultimate arrangement of the whole Exhibition, the space which each section might occupy, should agree as closely as was possible with the spaces fixed by the Commissioners. It was suggested that only those articles which did honour to our industrial skill as a nation should be admitted, and that the industry of the district should be represented with perfect fairness, so as to do the fullest credit to its industrial position.

The Commissioners then proceeded to cause copies of each individual application for space to be transmitted to the respective Local Committees for revision and correction where necessary, which, when returned by the Committees, were considered as the vouchers for the admission of the articles, and as tantamount to *their unqualified approbation of the articles*. In no case could a Local Committee *increase* the amount of the *total* space allotted to it by the Commissioners. The Commissioners appointed the 10th December, as the last day on which vouchers were to be received, but it was not until the 10th January, and even much later in some cases, that the Executive Committee obtained the whole of them, by which their labours were considerably increased, and the arrangements delayed.

If any productions had been rejected by any Local Committee, and the proprietor of them desired to appeal against the decision, it was competent for him to address the Commissioners through the Local Committee, who forwarded the appeal, with their own observations, and the Commissioners, upon consideration of the circumstances, confirmed or negatived the decision. The appeals, however, were few.

With the view of providing against the exhibition of duplicate articles of manufacture, the Commissioners, in cases where duplicates might have been admitted by *different* Local Committees, intimated that they would call upon the exhibitors of such duplicates to produce a certificate from the actual makers, stating which of the exhibitors had arranged with the maker to be proprietor of the absolute and exclusive right of sale and distribution of such article, and the preference of admission would be given to that exhibitor who was the sole pro-

exceed the possible allowance.

Reduction of demands for space.

Appeals.

prietor. The Commissioners were not called upon to exercise this power in a single instance.

Metropolis.

Although several Local Committees were formed in the Metropolis, the functions of rejection and selection of articles were performed by a united action of all the several Committees. Each Committee nominated Commissioners to represent a particular department of the Exhibition, who met together to consider the merits of the individual claims for space referred to them.

Such was the course of action by which the articles of British exhibitors were admitted to the Exhibition, and subjected to a preliminary judgment. Imperfect as it necessarily was, the general effect of it was satisfactory, and kept out of the Exhibition many unsuitable articles. Practically the system worked well, and there is no doubt that the Exhibition, as a whole, is a fair representation of the present state of British industry. An examination of the list of exhibitors shows that very few names indeed of artists or manufacturers of eminence are absent. It is probable, however, that there are fewer novelties in mechanical inventions than there would otherwise have been, had the Legislature provided against piracy of them at an earlier period than April, 1851.

The Building.

It is now time to speak of the origin of the Building, and of its general features, so far as they have influenced the system which has been adopted in classifying and arranging the articles in it. An account of its scientific construction will be found in another part of this volume.

As early as January, 1850, the Commission named a Committee "for all matters relating to the Building," consisting of—

The Duke of BUCCLEUCH.
The Earl of ELLESMORE.
Mr. BARRY, R.A.
Mr. CUBITT, Pres. Inst. C.E.

Mr. STEPHENSON.
Mr. COCKERELL, R.A.
Mr. BRUNEL.
Mr. DONALDSON.

Mr. CUBITT was elected Chairman of this Committee, and from the earliest period to the opening of the Exhibition, has given daily and unremitting attention to the subject, at great personal sacrifice of his valuable time. On the 21st of February, 1850, the Building Committee reported favourably on the fitness of the present site in Hyde Park, which had been suggested in the early stages of the undertaking, and for the use of which it had been already announced that HER MAJESTY's permission had been obtained. The Committee ventured at once to recommend that upwards of 16 acres should be covered in; a bold step at that time (21st February), when no data whatever of the space likely to be filled had been received (*Min. vii.*, p. 5). It was their opinion that it was desirable to obtain suggestions, by public competition, as to the general arrangements of the ground plan of the Building, and public invitations were accordingly issued. They also reported that when a plan for the general arrangement should have been obtained and approved, they would invite, by a second public notice, designs accompanied by tenders, from the builders and manufacturers of the United Kingdom, for the construction of the Building, in the form, and according to the general arrangement, which should be fixed upon. In answer to the invitation to send in plans, upwards of 245 designs and specifications were submitted. Of these 38 were contributed by foreigners: France sending 27; Belgium 2; Holland 3; Hanover 1; Naples 1; Switzerland 2; Rhein Prussia 1; Hamburg 1; 128 by residents in London and its environs; 51 by residents in provincial towns of England; 6 by

residents in Scotland; 3 by residents in Ireland; and 7 were anonymous. All these plans were publicly exhibited during a month, from the 10th of June, at the Institution of Civil Engineers, Great George Street, Westminster. The Building Committee reported on the merits of them, selecting two lists of the competitors. They considered the one "entitled to favourable and honourable mention," and the second "entitled to further higher honorary distinction." But they accompanied their report with the important announcement, that in their opinion there was no "single plan so accordant with the peculiar objects in view, either in the principle or detail of its arrangement, as to warrant them in recommending it for adoption" (*Min. xvii.*, p. 6). The Committee, therefore, submitted a plan of ^{First plan.} their own, and assisted by Mr. DIGBY WYATT, Mr. CHARLES HEARD WILD, and Mr. OWEN JONES, they prepared extensive working drawings, which were lithographed. They issued invitations for tenders to execute works in accordance with them, requesting from competitors, in addition, such suggestions and modifications, accompanied with estimates of cost, as might possibly become the means of effecting a considerable reduction upon the general expense. In the actual instructions they stipulated that tenders, in which changes were proposed, would be only entertained provided they were "accompanied by working drawings and specifications, and fully priced bills of quantities."

The Building Committee published in detail the reasons, both of economy and taste, which had induced them to prepare plans for a structure of brick, the principal feature of which was a dome two hundred feet in diameter. Public opinion did not coincide in the propriety of such a building on such a site, and the residents in the neighbourhood raised especial objections. The subject was brought before both Houses of Parliament; and in the House of Commons, on the 4th July, 1850, two divisions took place on the question, whether the proposed site should be used at all for any building for the Exhibition. In the one division, the numbers in favour of the site were 166 to 47, and in the second 166 to 46. The Commissioners published, at considerable length, a statement of the reasons which had induced them to prefer the site, and there can be no doubt that the force of this document mainly influenced the large majority in both divisions.

Whilst the plan of the Building Committee was under discussion, Mr. PAXTON ^{Mr. Paxton's proposal.} was led, by the hostility which it had incurred, to submit a plan for a structure chiefly of glass and iron, on principles similar to those which had been adopted and successfully tried by him at Chatsworth. Messrs. FOX, HENDERSON, and Co., tendered for the erection of the Building Committee's plan, and, strictly in accordance with the conditions of tender, they also submitted estimates for the construction of the building suggested by Mr. PAXTON, and adapted in form to the official ground plan. An engraving of Mr. PAXTON's original design was published in the *Illustrated London News*, 6th July, 1850, which, when compared with the building that has been actually erected, will show what changes were subsequently made. The Commissioners having fully investigated the subject, finally adopted, on the 26th July, Messrs. FOX, HENDERSON, & Co.'s tender to construct Mr. PAXTON's building, as then proposed, for the sum of £79,800. Considerable modifications, additions, and improvements in the architectural details were subsequently made, which have raised the proposed original cost of the building. As soon as the decision was made, fresh working drawings had to be prepared, and every means taken for expediting the works. These were carried on under the superintendence of Mr. CUBITT, assisted by Mr. D. WYATT, Mr. O. JONES, and Mr. C. WILD.

The formal deed of contract was not signed until the 31st October, although the first iron column was fixed as early as the 26th September, 1850, the contractors having thereby incurred, in their preparations, a liability of £50,000 without any positive contract ; in fact, great reciprocal confidence was manifested by the contracting parties. Whatever objections were entertained originally against the use of the site, gradually disappeared during the progress of the present building, and have become changed into positive approval and admiration, of the building itself and assent to the particular location of it. It should, however, be stated that a deed of covenant, to remove the building and give up the site within seven months after the close of the Exhibition, namely before the 1st June, 1852, has been entered into between HER MAJESTY and the Commissioners. The deed was sealed on the 14th November, 1850.

At a very early period the Commissioners resolved that the whole space of any building should be equally divided, and that one-half should be offered to Foreign countries, and the other reserved to Great Britain and her colonies. And almost simultaneously with this decision, before the plans of any building were settled, offers were made to foreign countries, assuring them more than 210,000 superficial feet of net exhibiting space. But after the ground plan had been settled, and a calculation had been made of the amount of space unavailable for exhibition that was absorbed by the transept, the avenues, the courts and offices, &c., it became evident that the remaining space, after deducting what had been assured to foreigners, was considerably less than the proportion due to Great Britain and her colonies, and much below the demands and wants of British exhibitors. It was at first suggested that an additional structure should be erected to accommodate the agricultural implements, outside the building, but it was found that reasons both of economy and of management greatly preponderated in favour of building an additional gallery, which was accordingly done.

Classification and arrangement of articles.

In order to settle the positive arrangement of articles in the building, it became necessary to prepare a more precise system of classification than that furnished by the classified list of admissible objects which the Commissioners had first issued. The various systems which had been tried in the French Expositions proved that any system based upon an abstract philosophical theory was unsuitable, and particularly so to the present Exhibition. It was also desirable that the system of classification should be made conducive to the readiest mode of consulting the vast collection, both by the general visitor and by the juries, who would have to consider the merits of the whole. Dr. PLAYFAIR, to whom the Commissioners had confided the superintendence of the juries, suggested that whilst preserving the original quadrupartite divisions of the Exhibition into Raw Produce and Materials, Machinery, Manufactures, and Fine Arts, those subdivisions which had been determined by commercial experience, should be adopted as far as practicable, as the basis of the Classification. Eminent men of science, and manufacturers in all branches, were invited to assist in determining each one the boundaries of his own special class of productions ; and it was resolved, for the purposes of the jury, to adopt thirty broad divisions, and to induce as far as practicable the application of this classification to all articles—both British and Foreign ; always, however, bearing in mind the fundamental rule, that the productions of an exhibitor would not be separated, except in very extreme cases. Accordingly, with few exceptions, all articles have been divided into the following thirty classes.

To save repetition, the numbers of the jurors which have been since assigned to each class are here given.

SECTION I. Raw Materials and Produce,—illustrative of the natural productions on which human industry is employed.

	No. of Jurors.		No. of Jurors.
1. Mining and Quarrying, Metallurgy, and Mineral Products	8	3. Substances used as food	6
2. Chemical and Pharmaceutical processes and products generally	8	4. Vegetable and Animal Substances used in manufactures, implements, or for ornament	8

SECTION II. Machinery for Agricultural, Manufacturing, Engineering, and other purposes and Mechanical Inventions,—illustrative of the agents which human ingenuity brings to bear upon the products of nature.

	No. of Jurors.		No. of Jurors.
5. Machines for direct use, including carriages, Railway and Naval Mechanism	12	9. Agricultural and Horticultural Machines and Implements (exceptional).	6
6. Manufacturing Machines and Tools	12	10. Philosophical Instruments and Miscellaneous Contrivances, including processes depending upon their use, Musical, Horological, Acoustical and Surgical Instruments	12
7. Mechanical, Civil Engineering, Architectural, and Building Contrivances	8		
8. Naval Architecture, Military Engineering and Structure, Ordnance, Armour and Accoutrements	8		

SECTION III. Manufactures,—illustrative of the result produced by the operation of human industry upon natural produce.

Designs for Manufactures are admitted in the same section with the class of articles for which they are proposed.

	No. of Jurors.		No. of Jurors.
11. Cotton	10	23. Works in precious Metals, Jewellery, and all articles of luxury not included in the other classes	8
12. Woollen and Worsted	12	24. Glass	8
13. Silk and Velvet	10	25. Ceramic Manufacture, China, Porcelain, Earthenware, &c.	8
14. Manufactures from Flax and Hemp	10	26. Decoration Furniture and Upholstery, Paper Hangings, Papier Maché, and Japanned Goods	12
15. Mixed Fabrics, including Shawls	12	27. Manufactures in Mineral Substances, used for building or decorations, as in Marble, Slate, Porphyries, Cement, Artificial Stones, &c.	6
16. Leather, including Saddlery and Harness, Skins, Fur, and Hair	10	28. Manufactures from Animal and Vegetable Substances, not being woven, felted, or laid	6
17. Paper, Printing, and Bookbinding	8	29. Miscellaneous Manufactures and Small Wares	10
18. Woven, spun, felted, and laid Fabrics, when shown for Printing and Dyeing	10		
19. Tapestry, including Carpets and Floor Cloths, Lace and Embroidery, fancy and industrial Works	10		
20. Articles of Clothing for immediate, personal, or domestic use	8		
21. Cutlery, Edge Tools and Hand Tools, and Surgical Instruments	6		
22. General Hardware	12		

SECTION IV.

30. Fine Arts, Sculpture, Models, and the Plastic Arts generally, Mosaics, Enamels, &c.—illustrative of the taste and skill displayed in such applications of human industry	12
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It had been originally contemplated by the Commissioners, that the arrangement of the whole Exhibition should be, not merely on the basis of the four sections, but that each similar article should be placed in juxtaposition without reference to its nationality, or local origin. To effect this, in so vast an Exhibition and within the short period of two months allowed for the arrangement, it was absolutely necessary to know, before the arrival of the articles, the approximate amount of space each would be likely to occupy—so that each on its arrival might be placed as nearly as possible in its appointed spot. But the event proved that this information, particularly in the case of Foreign countries, was unattainable.

A request was made that each Foreign country should inform the Commiss-

sioners, on or before the 1st of September, what space would be likely to be occupied respectively by its raw materials, its machinery, its manufactures, and fine arts; but only Austria, Belgium, Zollverein, and North Germany complied with this request, and furnished the information in sufficient detail. The great distance of other countries rendered the transmission of the information impossible, and practically it was not known what articles many very important countries would send, until they actually arrived. No choice remained but to adopt a geographical arrangement; and it was not until so late a period as the month of December that the Commissioners were enabled to decide the principles upon which the articles should be arranged in the Building. Circumstances connected with the form of the Building itself, the absence of the necessary information from Foreign countries, the great pressure for time, and above all the vital importance of punctually opening the Exhibition on the first of May, induced the division of the ground floor of the Building into two parts—the one being awarded to Foreign countries, and the other to the British colonies and the United Kingdom.

The productions of the United Kingdom and the British colonies are generally grouped *westward* of the central transept. The productions of each foreign country are placed together *eastward* of the transept—except machinery in motion, which, on account of the motive power being at the *north-west end* of the building, is placed in that part of the building. The productions of each country are classified nation by nation, and as far as practicable into the thirty classes already mentioned. The position of each country is determined in the building by its own latitude. As a general rule, machinery is placed at the *north* side, and raw materials and produce brought to the *south* side of the building. The intermediate parts are occupied by manufactures and fine arts. There is hardly any choice in respect of *light*, which is nearly the same in all parts of the building. The *south* side, as well as the roof of the building both in the *north* and *south* sides, is covered with canvas. The sides of the upper and the gallery tier on the *north* are not so covered. As a general rule applicable both to foreign countries and the United Kingdom, space was allotted on the following data:—on the ground floor, each area of 24 feet by 24 feet containing 576 feet superficial, was accounted as yielding exhibiting area of 384 feet, it being considered that 192 feet would be a sufficient allowance for passages. The width of these was determined by experiments in the building and by experience of those in the British Museum, in the Soho Bazaar, &c. In the gallery, half of each area was deducted for passages, and the other half, or 288 feet, assigned as exhibiting space. If the exhibitor wished to have more passage-room, then he was obliged to obtain it by deducting it from his exhibiting space: and every exhibitor, desiring to attend himself, or by his representative, during the Exhibition, had to deduct the sitting or standing space for such attendant from the superficial floor or counter-space allotted to him.

Allotment of space and position in the building.

System of passages.

A glance at the plan shows the adoption of a simple system of main passages. There is a central avenue 72 feet wide running from east to west, which is partially used to display both works of art and remarkable specimens of manufacture, and likewise to afford sitting room; parallel to this on each of the north and south sides are two uninterrupted passages 8 feet wide, one extending the length of the building and the other taking the circuit of the walls on each side. Besides the transept there are six main passages 8 feet wide, running from *north* to *south*. These were established as passages which must not be infringed upon:

portions of the building being then assigned to Foreign countries and to groups of exhibitors, a considerable latitude was permitted to them in arranging the other passages; at the same time, as the erection of the second gallery brought the whole building into a system of courts, spaces in the form of courts were allotted to Foreign countries, home districts, and classes of objects, and every one was encouraged to preserve them as much as possible. Thus on the British side, at the north there are the several machinery courts—the carriage court—the mineral court—the paper court—the miscellaneous court—the East India court; whilst at the south, there are three courts respectively for printed fabrics, for flax and woollen, and mixed fabrics:—furniture has its court, so have the manufactures of Birmingham and Sheffield—agricultural implements have an extensive court, and there are courts for mediæval furniture, for sculpture, for Canada and colonies, and the East Indies; on the east or Foreign side, almost every country has one or more courts,—France having eight, Austria six, &c.

Spaces of the requisite dimensions having been set apart to receive the productions of the Colonies and each Foreign country, the charge of these departments, as well as the arrangement of the productions, was handed over to each commissioner or agent representing such Colonies or Foreign country.

On account of the vast magnitude of the building, of the shortness of time available for arrangement after the completion of the building, which as the event proved was hardly a week before the opening, and of the delay in sending the goods, it was foreseen by the Executive Committee that it would be necessary to arrange the Foreign productions geographically and the whole of the British Exhibition, not by means of the articles themselves, but of descriptions of them, and to map out the whole space before the articles themselves arrived. Not a few of these descriptions were in the first instance most vague; the exhibitor desiring to reveal as little as possible of the specific character of his articles. Many exhibitors demanded space for “fabrics,” without specifying whether they were even woven or plastic. Others returned “woven fabrics,” leaving it doubtful whether they were made of cotton, wool, or flax; each forming a separate class. The demands for space, merely for “inventions” and “machines,” were numerous. Hence, there have crept in some errors in arrangement which would have been avoided had the description been more precise. Another source of difficulty has been the miscalculations of the amount of space which exhibitors really wanted. So frequently was the meaning of the term “superficial” and “square” feet misunderstood; so often were the expressions “horizontal” and “vertical” space disregarded or confounded, that in planning the arrangement of the Exhibition the difficulties of the Executive Committee have been great, and mistakes inevitable. One instance will afford a sufficient illustration. An important manufacturing town demanded 9,000 feet of wall or vertical space for the exhibition of its shawls, but when the demand came to be investigated, it was found to mean a demand for 900 feet of frontage on the wall, 10 feet high, and 3 feet deep—practically a demand for 27,000 superficial feet—to be arranged in such a way as would occupy half the length of the whole Exhibition! This demand of 27,000, was eventually compressed within 1,800 superficial feet of horizontal space, and submitted to, it must be admitted, with good-natured forbearance. Indeed, it may be said, that whilst almost every exhibitor desired some kind of special arrangement, convenient to himself, but inconvenient to every body else, almost every one submitted to a

Arrangement of
British articles.

curtailment of space, and a constraint on his wishes, with a patience that greatly lightened the labours of the Executive Committee. In fact, owing to these circumstances, inevitable in such a work, without precedent or experience, and to the very late period at which some demands for space were made, it was only possible to make an approximate guess at the space which each of the classes of goods of the United Kingdom would occupy, and to leave a considerable margin for adjustments.

It should be borne in mind that every Foreign country was able to regulate the character of the arrangement by the articles themselves. The whole of its articles were first collected, and then the arrangement settled. Every Foreign country, in this respect, stood in the same position as an individual British exhibitor; but on the British side, the general arrangement, and almost the position of each of the 7,000 exhibitors, were necessarily fixed before the articles were brought into the building. An elaborate classified list of subjects included in each of the 30 classes was prepared, and recommended as a basis of arrangement to exhibitors, though, from the causes already stated, the systematic classification could not be carried out in so complete a manner as was desired.

At the British side, every exhibitor had entire control over his own allotment, the Commissioners, from an early period, having decided that each exhibitor was at liberty to arrange such articles in his own way, so far as was compatible with the convenience of other exhibitors and of the public. When the exhibitor's wishes involved expense, the exhibitor defrayed it himself. Glass cases, frames, and stands of peculiar construction, and similar contrivances for the display or protection of the goods exhibited, were provided by the person requiring them at his own cost. Persons who wished to exhibit machines, or trains of machinery in motion, were permitted to do so. The Commissioners found steam not exceeding 30 lbs. per inch gratuitously to the exhibitors, and conveyed it in clothed pipes to such parts of the building as required steam power. Arrangements were made to supply water at a high pressure gratuitously to exhibitors, who had the privilege of adapting it to the working of their machinery, &c. And the Chelsea Water-works contracted to supply 300,000 gallons of water per day, at the rate of £50 per month.

Catalogues.

It was decided that two Official Catalogues should be prepared and published by the authority of the Commission; the one of a large size, containing full notices of everything that the exhibitor desired to state, and the other an abridgment containing the names of the exhibitors only, with a very general summary of the articles they exhibited. The right of printing and publishing these was offered for competition. The contractors were at liberty to fix the price of the large Catalogue. The smaller Catalogue was to be sold at 1s., and the contractors were bound to pay 2d. for every copy sold to the funds. Several parties tendered. The offer of Messrs. SPICER BROTHERS, and Messrs. CLOWES and SONS, as the highest, was accepted; the amount of their offer being £3,200. It was also provided (*Min. xxix.*, p. 1), that should the number sold exceed 500,000 of the small edition, and 5,000 of the large, then the contractors should give a further sum for all sold over and above those numbers. The contract was sealed 6th January, 1851.

Insurance from
fire.

The insurance of goods from fire, or other kinds of accidents, and the responsibility for all losses, devolved upon the exhibitors. The Metropolitan Fire

Brigade took charge of the safety of the Building from fire. With the permission of the Secretary of State for the Home Department, the responsibility for the whole of the police arrangements was placed upon Mr. MAYNE, the Chief Commissioner of Police. The Commissioners expressed their willingness to pay the sum of £5,043 19s. 4d., in consideration of the Commissioners of Police providing the force necessary to be employed outside the Exhibition Building (viz., at the various entrances and approaches within Hyde Park), for the period of six months, from 1st March to 1st September, stipulating, however, that should it appear that the additional force which it was contemplated to provide was greater than was actually required, a proportionate reduction was to be made. The Commissioners left the question of the police force necessary for the interior watching of the building, and of the amount of expense in connection with it, in the hands of Her Majesty's Government, "in the full assurance that the utmost economy will be observed that is compatible with the satisfactory execution of that duty" (*Min. xxxiii.*, p. 2).

The Commissioners considered that it would conduce to the convenience of visitors to permit light and moderate refreshments to be obtained and consumed in *certain prescribed parts* of the building but that it would be inconsistent with the nature of the Exhibition to allow the building to assume the character of an hotel, tavern, or dining-rooms. In the Central Area are sold ices, pastry, sandwiches, patties, fruits, tea, coffee, chocolate, cocoa, lemonade, seltzer and soda water; whilst in the Eastern and Western Areas are sold bread, butter and cheese, tea, coffee, chocolate, cocoa, ginger beer, spruce beer, and similar drinks, together with the other articles sold in the Central Area. No refreshments are to be taken out of the Areas. No wines, spirits, beer, or intoxicating drinks are permitted to be sold to the visitors. The privilege of supplying refreshments on these terms was put up to competition, and the tender of Messrs. SCHWEPPPE, wherein they offered a sum of £5,500 for the privilege, was accepted. Waiting rooms and conveniences have likewise been provided at a moderate charge at each of the refreshment areas.

With the view of affording information in respect of lodgings for the working classes which might be required in London, a register was opened, in which the names and addresses of persons disposed to provide accommodation for artizans from the country whilst visiting the Exhibition were entered. In doing this, the Commissioners intimated that they did not propose to charge themselves in any respect with the management, but simply to afford information. It was thought most expedient that the public should be led to make its own arrangements; and the object which the Commissioners had in view was simply to call public attention to the subject. Various kinds of organizations have arisen to meet any demands which may arise. The superintendence of this subject was intrusted to Colonel REID and Mr. ALEXANDER REDGRAVE.

The principal railways agreed to afford some increased public accommodation during the Exhibition. Each Railway Company, both in the carriage of goods and passengers, and in the conveyance and delivery of articles intended for the Exhibition, allowed a deduction of one-half of the railway charge to exhibitors, subject to certain conditions. In order to encourage the early formation of "Subscription Clubs" in the country, to enable the labouring classes to travel to London and back during the Exhibition, the Railway Companies undertook to convey all persons so subscribing to local clubs at a single railway fare for both

journeys, up and down, which should in no case exceed the existing fare by Parliamentary trains for the journey in one direction, with some abatement for longer distances, subject to the following conditions, which they published in September, 1850 :—

That in respect of journeys to London, the first 100 miles shall always be charged as 100 miles, and where the distance shall exceed 100 miles, an allowance in the fare be made on the following scale :—

For the first excess 100 miles, 1-5th, or 20 per cent. be allowed.

For the second excess 100 miles, 3-10ths, or 30 per cent. be allowed.

For the third excess 100 miles, 2-5ths, or 40 per cent. be allowed.

For the fourth excess 100 miles, $\frac{1}{2}$ or 50 per cent. be allowed.

Thus for instance :—

A distance of 150 miles will be paid for as 140 miles.

„	200	„	„	180	„
„	300	„	„	250	„
„	400	„	„	310	„
„	500	„	„	360	„

and in like proportion between the respective distances.

Regulations respecting the admission of visitors.

The consideration of the admission of Visitors was, in the first instance, referred to a Committee, and upon the recommendations of their Report, the Commissioners published decisions, in which they stated that their attention had been principally directed to the following points :—

1st. The necessity of making such arrangements as shall secure the convenience of the public visiting the Exhibition, whether for study and instruction, or for the more general purposes of curiosity and amusement. 2nd. The due protection and security of the property deposited in the building. 3rd. The effective control over the number of visitors, while the servants and officers intrusted with the maintenance of order and regularity in the building are comparatively inexperienced in their duties. 4th. The necessity of maintaining the self-supporting character of the Exhibition, and of defraying the liabilities incurred. 5th. The desire of the Commissioners to render the Exhibition accessible to all persons at the lowest possible charge, and with the least delay which a due regard to the preceding considerations will admit.

Having these objects in view, Her Majesty's Commissioners have determined to adopt the following regulations :—

The Exhibition will be open every day (Sundays excepted).

The hours of admission and other details will be announced at a subsequent period.

The charges for admission will be as follows :—

Season tickets for a gentleman	.	.	.	£	3	3	0
Season tickets for a lady	.	.	.		2	2	0

These tickets are not transferable; but they will entitle the owner to admission on all occasions on which the Exhibition is open to the public.

The Commissioners reserve to themselves the power of raising the price of the season tickets when the first issue is exhausted, should circumstances render it advisable. On the first day of exhibition season tickets only will be available; and no money will be received at the doors of entrance on that day.

On the second and third days the price of admission on

entrance will be (each day) £1 0 0

On the fourth day of exhibition 0 5 0

To be reduced on the twenty-second day to 0 1 0

From the twenty-second day the prices of admission will be as follows :—

On Mondays, Tuesdays, Wednesdays, and Thursdays in each week	1s. 0d.
On Fridays	2s. 6d.
On Saturdays	5s. 0d.

No change will be given at the doors. This regulation is necessary to prevent the inconvenience and confusion which would arise from interruption or delay at the entrances. Should experience in the progress of the Exhibition render any alteration in these arrangements necessary, the Commissioners reserve to themselves the power of making such modifications as may appear desirable, of which due and timely notice, however, will be given to the public. At the first opening of the Exhibition, the hours of admission were fixed from 10 A.M. till 6 P.M.

Upon the question how far, and in what instances, any parties should be furnished with free admissions, the Committee reported,—

That it is very desirable that that privilege should be restricted to as few cases as possible, and feeling the importance of carrying out to the greatest practicable extent a regulation of this nature, they would submit whether it might not be expedient that the Commissioners should place themselves in the same position as the public in general with regard to the admission to the Exhibition. The members of the Executive Committee have expressed their wish to subject themselves to the same conditions as the Royal Commissioners in this respect.

The following are the cases in which the Committee would recommend that an exception to the general rule should be made, and free admissions granted :—

1st. Persons in the employment of, and provided with tickets issued by the Executive Committee, such as the heads of sectional departments, the clerks, the watchers, the cleaners, the Police, the Sappers and Miners. 2nd. Servants of Foreign Commissioners and of exhibitors admitted under the provisions of the 14th published decision of the Commissioners for the purpose of watching the goods sent by their employers, or explaining them to visitors; such servants being provided with tickets issued by the Executive Committee under strict regulations to be hereafter laid down. 3. The press, both metropolitan and provincial; the tickets in both cases admitting the editor or his representative. 4th. The juries, on the production of tickets that have been issued and registered by the Executive Committee, on certain days to be hereafter fixed by the Executive Committee.

And the power of carrying these rules into effect was given to the Executive Committee.

The inauguration of the Exhibition took place on 1st May, in accordance with the arrangements laid down in the accompanying document, which was published by the Commissioners :—

Her Majesty having signified her royal pleasure that arrangements should be made to enable Her Majesty to gratify a wish very generally expressed on the part of the public, to be present at a ceremony by which Her Majesty should open the Exhibition of the Works of Industry of all Nations, on the 1st of May, Her Majesty's Commissioners hereby give notice that the programme of this ceremony, and the regulations under which the holders of season tickets will be admitted, are as follow :—

Exhibitors' attendants who have been sanctioned by the Executive Committee will be admitted between the hours of 8 and 9 o'clock, at doors specified on their cards, and will immediately take their places by the counters or objects exhibited by their employers.

Holders of season tickets will be admitted at all doors on the east, south, and west of the building, between the hours of 9 and half-past 11 o'clock, and will be allowed to take their places, subject to police regulations, in the lower part of the building, and in the galleries, except the parts railed off in the nave and transept.

A platform will be raised to the north of the centre of the transept, on which a chair of state will be placed.

Her Majesty's Commissioners will assemble at half-past 11 o'clock in the transept, opposite the platform, together with their Executive Committee and the Foreign Acting Commissioners, in full dress or in plain evening dress.

His Grace the Archbishop of Canterbury, Her Majesty's Ministers, the great Officers of State, and the Foreign Ambassadors and Ministers, will take their places on the platform to the right and left of the chair of state, in full dress, also at half-past 11 o'clock.

Her Majesty, proceeding in State, with the royal family, foreign guests, &c., and her and their suites from Buckingham Palace up Constitution Hill, and down Rotten Row, will enter the Exhibition building by the north entrance precisely at 12 o'clock. She will ascend the platform and take her seat in the chair of state.

On Her Majesty's arrival a choir will sing "God Save the Queen."

On the Queen taking her seat His Royal Highness Prince Albert will join the Royal Commissioners, and when the music has ceased proceed at their head to the platform, and read to Her Majesty a short report of the proceedings of the Commission up to that time, which he will then deliver to Her Majesty, together with the catalogue of the articles exhibited. Her Majesty will return a gracious answer, handed to her by the Secretary of State; after which His Royal Highness Prince Albert will take his place again by the side of Her Majesty.

His Grace the Archbishop of Canterbury will then say a prayer, invoking God's blessing upon the undertaking, followed by a short anthem sung by the choir.

A Royal procession will then be formed, preceded by the Commissioners, which will turn to the right, move to the west end of the nave by its north side, return to the east end of the nave by its south side, including the south end of the transept, and come back to the centre along the north side of the nave; thus enabling all those present, who will be expected to keep the places which have been assigned to them, to see Her Majesty and the procession.

During the procession the organs appointed will play marches, taking the music up at the Queen's approach.

On Her Majesty's return to the platform the Queen will declare "the Exhibition opened," which will be announced to the public by a flourish of trumpets and the firing of a Royal Salute on the north of the Serpentine; whereupon the barriers, which had kept the nave clear, will be thrown open, and the public will be allowed to circulate.

Her Majesty will then return to Buckingham Palace by the route by which she came.

All the doors, which will have been closed at half-past eleven o'clock, will, upon Her Majesty's departure, be opened again.

In announcing the PRIZES, the Commissioners laid down certain general principles for the guidance of the Juries, which they published as follows:—

In the department of RAW MATERIALS AND PRODUCE, for instance, prizes will be awarded upon a consideration of the value and importance of the article, and the superior excellence of the particular specimens exhibited; and in the case of prepared materials, coming under this head of the Exhibition, the Juries will take into account the novelty and importance of the prepared product, and the superior skill and ingenuity manifested in the process of preparation.

In the department of MACHINERY, the prizes will be given with reference to novelty in the invention, superiority in the execution, increased efficiency, or increased economy, in the

use of the article exhibited. The importance, in a social or other point of view, of the purposes to which the article is to be applied, will also be taken into consideration, as will also the amount of the difficulties overcome in bringing the invention to perfection.

In the department of MANUFACTURES, those articles will be rewarded which fulfil in the highest degree the conditions specified in the sectional list, viz.:—Increased usefulness, such as permanency in dyes, improved forms and arrangements in articles of utility, &c. Superior quality, or superior skill in workmanship. New use of known materials. Use of new materials. New combinations of materials, as in metals and pottery. Beauty of design in form, or colour, or both, with reference to utility. Cheapness, relatively to excellence of production.

In the department of SCULPTURE, MODELS, and the PLASTIC ART, the rewards will have reference to the beauty and originality of the specimens exhibited, to improvements in the processes of production, to the application of art to manufactures, and, in the case of models, to the interest attaching to the subject they represent.

These general indications are sufficient to show that it is the wish of the Commissioners, as far as possible, to reward all articles in any department of the Exhibition, which may appear to competent judges to possess any decided superiority, of whatever nature that superiority may be. It is the intention of the Commissioners to reward excellence in whatever form it is presented, and not to give inducements to the distinctions of a merely individual competition. Although the Commissioners have determined on having three medals of different sizes and designs, they do not propose to instruct the Juries to award them as first, second, and third in degree for the same class of subjects. They do not wish to trammel the Juries by any precise limitation; but they consider that the Juries will rather view the three kinds of medals as a means of appreciating and distinguishing the respective characters of the subjects to be rewarded, and not of making distinctive marks in the same class of articles exhibited. They fully recognise that excellence in production is not only to be looked for in high-priced goods, in which much cost of labour and skill has been employed, but they encourage the exhibition of low-priced fabrics, when combining quality with lowness of price, or with novelty of production. They can readily conceive that Juries will be justified in giving the same class medal to the cheapest calico prints made for the Brazilian or South American market, as they would to the finest piece of *Mousseline de Soie* or *Mousseline de Laine*, if each possessed excellence of its own kind.

All persons, whether being designers or inventors, the manufacturers or the proprietors of articles, will be allowed to exhibit; but they must state the character in which they do so. They may also state the names of all or any of the parties who have aided in the production. In awarding the prizes, however, it will be for the Juries to consider, in each individual case, how far the various elements of merit should be recognised, and to decide whether the prize should be handed to the exhibitor, or to one or more of those who have aided in the production.

Lastly, the Commissioners, in announcing their intention of giving medal prizes, do no propose altogether to exclude pecuniary grants, either as prizes for successful competition, or as awards under special circumstances, accompanying, and in addition to the honorary distinction of the medal. There may be cases in which, on account of the condition of life of the successful competitor (as for instance, in the case of workmen) the grant of a sum of money may be the most appropriate reward of superior excellence; and there may be other cases of a special and exceptional nature, in which, from a consideration of the expense incurred in the preparation or transmission of a particular article entitled to a prize, combined with a due regard to the condition and pecuniary circumstances of the party exhibiting, a special grant may with propriety be added to the honorary distinction. The Commissioners are not prepared, for the present, at least, to establish any regulations on these heads. They consider it probable that a wide discretion must be left to the Juries, to be hereafter appointed, in respect to the award of money prizes, or the grant of money in aid of

honorary distinctions ; it being understood that such discretion is to be exercised under the superintendence and control of the Commission.

Articles marked "Not for Competition" cannot be admitted.

Medals obtained by competition.

The Commissioners decided to select bronze for the material in which the medals should be executed, considering that metal to be the better calculated than any other, for the development of superior skill and ingenuity in the medallic art, and at the same time the most likely to constitute a lasting memorial of the Exhibition. There are three bronze medals, of different sizes and designs, which were obtained by public competition. Three prizes of 100*l.* each, were awarded for the three designs of the reverses, which appeared the most meritorious, to the following artists :

M. HIPPOLYTE BONNARDEL, Paris.

Mr. LEONARD C. WYON, London.

Mr. G. G. ADAMS, London.

Three prizes of 50*l.* each were also given for the three best designs not accepted, as follows :

Mr. JOHN HANCOCK, London.

Mons. L. WIENER, Brussels.

Mr. GAYRARD, Paris.

(*Min. xxii.*, p. 2).

One hundred and twenty-nine models were received, and were exhibited in the rooms of the Society of Arts. The obverses of the medals are heads of HER MAJESTY the QUEEN, and HIS ROYAL HIGHNESS THE PRINCE ALBERT, executed by W. WYON, R. A., the medallist of the Mint, after the type of the Syracusan medals.

The inscriptions. The Committee appointed (consisting of the Hon. W. E. GLADSTONE, the Lord LYTTELTON, the Hon. T. B. MACAULAY, and the Rev. H. G. LIDDELL, Head Master of Westminster School) to suggest inscriptions for the Prize Medals, recommended, for the medal to be executed after design No. 1, the following line, very slightly altered, from MANILIUS (*Astronomicon*, v. 737) :—

"Est etiam in magno quædam res publica mundo."

For the medal from design No. 2, the following line from the first book of the *Metamorphoses* of OVID (v. 25) :—

"Dissociata locis concordi pace ligavit."

For the medal from design No. 3, the following line from CLAUDIAN (*Eidyll.*, vii. 20) :—

"Artificis tacitæ quod meruere manus."

Constitution of the juries.

Under the general conditions by which the juries were constituted, it was provided that there should be one jury to each of the 30 classes into which the Exhibition had been divided. The number of jurors in each jury was determined by the amount of articles exhibited in each class, and the greater or less diversity of the subjects included in it, but no abstract idea of the relative importance of the classes was involved in the numbers attached to them. The list of the 30 classes has already been given (*see p. 23*), with the number of jurors appointed to each class. In addition to the juries there described, it was found necessary to appoint three sub-juries ; one subordinate to Class V., for carriages, and two subordinate to Class X., viz., for musical and for surgical instruments. The

increased number of jurors for these three sub-juries was 22, of whom half were foreigners.

To facilitate the working, especially with reference to the foreign jurors, the 30 classes were collected into six groups:—

Classes 1, 2, 3, 4, forming the group of Raw Materials.

Classes 5, 6, 7, 8, 9, 10, forming the group of Machinery.

Classes 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, forming the group of Textile Fabrics.

Classes 21, 22, 23, 24, 25, forming the group of Metallic, Vitreous, and Ceramic Manufactures.

Classes 26, 27, 28, 29, forming the group of Miscellaneous Manufactures.

The thirtieth class forming the group of Fine Arts.

A classified list of subjects under the province of each jury was prepared, and formed the limitation to each class, being the same as that upon which the arrangement of articles in the building had been made.

The constitution of juries was determined to be as follows:—The jury in general consisted of an equal number of British subjects and of Foreigners. If Foreign Commissions did not send a sufficient number of Foreigners to represent one-half of the jurors in each class, the deficient numbers might be completed by the appointment of British subjects, or be made up by the persons named by the Foreign Commissioners in London. Country as well as metropolitan districts were represented on the jury. Each jury was presided over by a chairman nominated by the Commissioners, and he was aided by a deputy chairman elected by the jury. Juries were able to appoint one of their own body as a reporter. The chairmen of the thirty juries were associated as a body, and called the “Council of Chairmen.” In the absence of a chairman, the deputy-chairman took his seat at the Council. The Council of Chairmen was constituted, as far as practicable, of British subjects and Foreigners in equal numbers. The first and chief duties of the Council of Chairmen were to frame the rules for the guidance of the juries. The Council had to determine the conditions under which the 1st, 2nd, and 3rd class medals respectively were to be awarded, and to define the general principles to which it would be advisable to conform in the awards in the several departments of the Exhibition. It was the wish of the Commission that medals should be awarded to articles possessing decided superiority of whatever nature that superiority might be, and not with reference to a merely individual competition. The Juries were reminded that “the three classes of medals are intended to distinguish the respective characters of subjects, and not as first, second, and third in degree for the same class of subjects.” It was the function of the Council of Chairmen to see that the awards of the individual juries were in accordance with the rules before they were considered final. The propriety of pecuniary grants to individual exhibitors were considered by the Commissioners only on the recommendation of the several juries, sanctioned by the Council of Chairmen.

The mode of appointing the English jurors was as follows:—Those towns which exhibited to a considerable extent in any of the classes were invited to send a list of names of persons who would efficiently represent the knowledge of those classes as jurors. It was necessary to state according to the classified jury list, the subdivisions of the class with which the person recommended was specially acquainted; and all nominations were made in classes, and not in the aggregate.

Appointment of
English jurors,

As it was necessary to reduce the lists to the standard number for each jury, the Commission charged itself with this duty. Those persons who had been recommended as jurors, but who from the small numbers of the jury were not placed on it, might, on the application of a jury, be called in on special occasions to give aid, under the title of associates, but without a vote.

and Foreign
jurors.

The nomination of the foreign jurors was conducted on a somewhat different principle. The Foreign Commissioners submitted, that a fuller representation of the foreigners of all nations in the body which it was proposed to constitute for the purpose of confirming the award of individual juries would be secured, by referring the awards for confirmation to a general meeting of the juries of *allied* subjects, according to the groupings already spoken of. And the Commissioners assented to this modification. The selection of jurors for each foreign country was of course left to that country; persons of skilled knowledge being chosen to represent those classes of objects in which the country was a considerable exhibitor. It was recommended that in cases where the Central Commission was too remote to obtain the nomination of the jurors in sufficient time, the Foreign Commissioners should put themselves into communication with the diplomatic representatives of their respective countries in London. The number of jurors allotted to each foreign country by the Commissioners, upon the suggestion of the Foreign Commissioners, was as follows:—Austria, 15; Zollverein, comprehending Bavaria, Prussia, Saxony, Wurtemburg, &c., 19; Belgium, 11; North Germany, comprehending Bremen, Hamburg, and Hanover, 3; Denmark, 1; France, 32; Greece, 1; Holland, 2; Portugal, 2; Russia, 6; Italy, comprehending Sardinia and Tuscany, 6; Spain, 3; Sweden and Norway, 1; Switzerland, 4; Turkey, 3; United States, 21; Egypt, 2.

If exhibitors accepted the office of jurors, they ceased to be competitors for prizes in the class to which they were appointed, and these could not be awarded either to them individually, or to the firms in which they might be partners. Juries were at liberty to take evidence when a majority of the jury deemed it advisable, and to name the persons to be consulted. Jurors of another class might also be called in aid by a jury, when a knowledge involved in that class was required. Juries were empowered to act in matters of detail by sub-committees, but no award could be made except by the majority of the jury. Before a jury could finally make its awards, it was necessary they should have been submitted to a meeting of the juries of allied subjects, as indicated in the groups. These meetings of allied juries had power to confirm the award of the juries, and to investigate any disputed decisions. Before, however, the awards were published, it was requisite they should have been submitted to a Council, consisting of the chairmen of the juries, in order to secure uniformity of action, and a compliance with the regulations originally laid down by that body. The awards of a jury, when reported by the Council of Chairmen as being made in conformity to the rules, were final. The juries were aided in the general transaction of the business by a person named by the Royal Commissioners, who by himself, or by a deputy approved of by the Commission, was present at their deliberations, for the purpose of explaining the rules of the Commission. This nominee of the Commission, who was Dr. LYON PLAYFAIR, did not have a vote in any of the juries, or at all interfere in the adjudication of awards.

The Exhibition is open to tell its own tale, and is now submitted to the judgment of the world.

All that has been done has been the work of a short and anxious period of sixteen months. During that time, Her Majesty's Commissioners have assembled together upwards of forty times, to discuss and determine all principles. When the Commissioners were not sitting, every important detail of action was considered by His Royal Highness, the President, and by Lord GRANVILLE, as Chairman of the Finance Committee. From time to time, as their services have been required, the most distinguished persons in art and science have met in Committees, liberally to afford their assistance to the Commissioners. These gentlemen, to whom the Exhibition is thus indebted, are named elsewhere; and it may be permitted to append a list of the staff, materially strengthened by officers of the Royal Engineers, both of Her Majesty's and the Honourable East India Company's service, which has carried the work into execution, and also to acknowledge the effective aid of the Sappers and Miners who have been permitted by the Master General of the Ordnance to bring their military discipline and business knowledge to aid in the arrangements of the Exhibition.

The work is done, and the collection made of the productions of 15,000 exhibitors, working with the ability God hath given them. To these we may say with St. Paul,—“In lowliness of mind let each esteem others better than themselves.” And to spectators we may reiterate the hope expressed by the PRINCE, that “the first impression which the view of this vast collection will produce will be that of deep thankfulness to the Almighty for the blessings which he has bestowed upon us already here below; and the second, the conviction that they can be only realized in proportion to the help which we are prepared to render to each other—therefore, only by peace, love, and ready assistance, not only between individuals, but between the nations of the earth.”

HENRY COLE.

*Exhibition, Hyde Park,
30th April, 1851.*

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PHILIP PUSEY, Esq., M.P., F.R.S. Sir WILLIAM HOOKER, LL.D., F.R.S. Professor ROYLE, M.D., F.R.S.

(c.) ANIMAL KINGDOM.

Rt. Hon. Lord STANLEY. Professor OWEN, F.R.S. Professor E. FORBES, F.R.S. Professor BRANDE, F.R.S. Professor HOFMANN.

SECTION II.—MACHINERY.

Rt. Hon. the Earl of ROSSE, K.P., Pr. of R.S. Sir JOHN RENNIE, F.R.S. Sir JOHN HERSCHEL, Bart, F.R.S. WILLIAM CUBITT, Esq., F.R.S., Pr. of I.C.E. ROBERT STEPHENSON, Esq., M.P., F.R.S. The ASTRONOMER ROYAL, F.R.S. PHILIP PUSEY, Esq. M.P., F.R.S.

Professor WALKER, F.R.S. Professor WILLIS, F.R.S. I. K. BRUNEL, Esq., F.R.S. Sir BALDWIN WALKER, K.C.B. The PRESIDENT of the College of Surgeons. Sir GEORGE SMART.

(a) AGRICULTURAL IMPLEMENTS.

Hon. DUDLEY PELHAM, M.P. (Deceased.) Col. B. CHALLONER. W. MILES, Esq., M.P. JOSEPH LOCKE, Esq. M.P., F.R.S.

PHILIP PUSEY, Esq., M.P., F.R.S. BRANDRETH GIBBS, Esq. H. S. THOMPSON, Esq. J. V. SHELLEY, Esq.

SECTION III.—MANUFACTURES.

Rt. Hon. W. E. GLADSTONE, M.P. Alderman THOMPSON, M.P. RICHARD COBDEN, Esq., M.P. THOMAS FIELD GIBSON, Esq. THOMAS BAZLEY, Esq. JOHN GOTTF, Esq. HERBERT MINTON, Esq. APSLEY PELLATT, Esq. R. REDGRAVE, Esq., R.A. J. R. HERBERT, Esq., R.A. H. J. TOWNSEND, Esq. J. JOBSON SMITH, Esq.

J. H. MARSHALL, Esq., M.P. J. H. VIVIAN, Esq., M.P. Professor GRAHAM, F.R.S. Professor WOODCROFT. Professor COWPER. JOHN HARDMAN, Esq. H. T. HOPE, Esq., M.P. Sir JOHN GUEST, M.P. PASCOE GRENFELL, Esq., M.P. J. D. MORRIES STIRLING, Esq., F.R.S.E. Sir JOHN BOILEAU, Bart., F.R.S.

SECTION IV.—SCULPTURE, MODELS, AND THE PLASTIC ART.

Rt. Hon. the Earl of ABERDEEN, K.T., F.R.S., Pr. S.A. Rt. Hon. Viscount CANNING. Rt. Hon. Lord ASHBURTON. Sir RICHARD WESTMACOTT, R.A. Sir CHARLES LOCK EASTLAKE, P.R.A., F.R.S. CHARLES BARRY, Esq., R.A., F.R.S.

CHARLES BARING WALL, Esq., M.P., F.R.S. W.M. WYON, Esq., R.A. EDWARD HODGES BAILY, Esq., R.A., F.R.S. D. MACLISE, Esq., R.A. THOMAS UWINS, Esq., R.A.

LIST OF COMMISSIONERS, &c. APPOINTED ABROAD TO PROMOTE THE EXHIBITION OF 1851 IN LONDON.

FRANCE.

LA Commission générale, instituée par arrêtés des 28 Février et 11 Mars 1850, s'est, dans sa séance du 16 Mars, divisée en 6 Commissions spéciales, dont voici les attributions et la composition :*

1^o Commission des Affaires administratives et de la Correspondence.

M. CHARLES DUPIN, de l'Académie des Sciences, Président de la Commission Générale.
 M. DE LESSEPS, Directeur des Consulats et des Affaires Commerciales au Ministère des Affaires Etrangères.
 M. DE LAVENAY, Secrétaire-Général du Ministère de l'Agriculture et du Commerce.
 M. MONNY DE MORNAY, Chef de la division de l'Agriculture.
 M. FLEURY, Chef de la division du Commerce Extérieur.
 M. DELAMBRE, Chef de la division du Commerce Intérieur.
 M. CHEMIN-DUPONTES, Chef du Bureau des Faits-Commerciaux, Secrétaire de la Commission Générale.

2^o Commission des Arts Agricoles.

M. HERICART DE THURY, de l'Académie des Sciences.
 M. TOURRET, Vice Président du Jury Central.
 M. PAYEN, de l'Académie des Sciences.
 M. ARMAND SEGUIER, de l'Académie des Sciences.
 M. DE KERGORLAY, Membre de la Société Nationale et Centrale d'Agriculture.
 M. MONNY DE MORNAY.

3^o Commission des Arts Mécaniques et de Précision.

M. POUILLET, de l'Académie des Sciences.
 M. ARMAND SEGUIER, de l'Académie des Sciences.
 M. MORIN, de l'Académie des Sciences.
 M. COMBES, de l'Académie des Sciences.
 M. MICHEL CHEVALIER, Ingénieur en Chef des Mines.
 M. LE CHATELIER, Ingénieur des Mines.

4^o Commission des Arts Chimiques et Métallurgiques.

M. BALARD, de l'Académie des Sciences.
 M. HERICART DU THURY.

M. PAYEN.

M. MICHEL CHEVALIER.

M. EBELMEN, Directeur de la Manufacture Nationale de Sèvres.

M. LE CHATELIER.

5^o Commission des Tissus.

M. MIMEREL, Président de la Commission des Tissus au Jury Central.
 M. LEGENTIL, Président de la Chambre de Commerce de Paris.
 M. BARBET, Membre du Jury Central de l'Industrie Nationale.
 M. SALLANDROUZE DE LAMORNAIX, Membre du Jury Central.
 M. DE LAVENAY.

6^o Commission des Beaux-Arts et Arts divers.

M. FONTAINE, de l'Académie des Beaux Arts.
 M. LEON DE LABORDE, de l'Académie des Beaux Arts.
 M. ARMAND SEGUIER.
 M. EBELMEN.
 M. DE LAVENAY.
 M. DELAMBRE.

Dans une deuxième séance qui a eu lieu le 20 courant, ont été élus Présidents des diverses Commissions :—

I. Commission Administrative	{ M. CHARLES DUPIN.
II. Commission des Arts Agricoles	
III. Commission des Arts Mécaniques et de Précision	{ M. COMBES.
IV. Commission des Arts Chimiques et Métallurgiques	
V. Commission des Tissus	{ M. LEGENTIL.
VI. Commission des Beaux-Arts et Arts divers	

M. FONTAINE.

Tous les renseignements destinés à la Commission doivent être adressés au Ministère de l'Agriculture et du Commerce.

BELGIUM.

President.—M. DE BROUCKERE, Bourgmestre de la Ville de Bruxelles, Membre de la Chambre des Représentants, Président du Jury l'Exposition Industrielle de 1847.

Membres.—M. BELLEFROID, Chef de la Division de l'Agriculture au Département de l'Intérieur.

M. BENÔT FABER, Délégué de la Chambre de Commerce de Namur.

M. CAPITAIN, Fabricant à Liège, délégué de la Chambre de Commerce de cette Ville.

M. CLAES (Paul) DE LEMBECQ, Agronome.

M. KINT, Inspecteur pour les Affaires Industrielles, au Département de l'Intérieur.

M. KUMS, Fabricant à Anvers, délégué par la Chambre de Commerce de cette Ville.

M. MANILIUS, Membre de la Chambre des Représentants, délégué par la Chambre de Commerce de Gand.

M. OVERMAN, Fabricant à Tournay, délégué par la Chambre de Commerce de cette Ville.

M. PARTOES, Directeur du Commerce Extérieur et des Consulats au Département des Affaires Etrangères.

M. QUOLIN, Secrétaire Général au Département des Finances.

M. ROMBERG, Chef de la Division de l'Industrie au Département de l'Intérieur.

M. SIMONIS, (Armand), Président de la Chambre de Commerce de Verviers.

M. SPITAELS, (Ferdinand), Membre du Sénat, délégué par la Chambre de Commerce de Charleroy.

M. VAN HOOFF, Fabricant à Saint-Nicolas, délégué par la Chambre de Commerce de cette Ville.

M. VERCROYSE-BRUNEEL, (H.), Fabricant à Courtrai, délégué de la Chambre de cette Ville.

M. VERREY, Fabricant à Bruxelles, délégué par la Chambre de Commerce de cette Ville.

NETHERLANDS.

President—M. JONKHUR D. R. GIVERS DEYNoot, Directeur de la Société pour l'Encouragement de l'Industrie à Haarlem, demeurant à Rotterdam.

Membres—M. le Docteur G. SIMONS, Directeur de l'Académie Royale à Delft. M. D. C. BUCHLER, Membre de l'Institut Royal des Pays-Bas, Vice-Président de l'Académie Royale des Beaux Arts à Amsterdam.

AUSTRIA.—A Commission formed, consisting of the following Members:—

Präsident—Herr ANDREAS RITTER v. BAUMGARTNER, k. k. geheimer Rath, Sections-Chef im Ministerium der Finanzen, Vice-Präsident der k. k. Akademie der Wissenschaften in Wien, &c.

Präsidenten-Stellvertreter—Herr MICHAEL RITTER v. SPÖRLIN, Fabriksinhaber, Mitglied der Wiener Handelskammer.

Vertreter der Ministerien—Herr Dr. KARL HOCK, Ministerialrath im Ministerium des Handels. Herr Dr. MORIZ RITTER v. BESTENECK, Sectionsrath im Ministerium der Finanzen.

Herr JOSEPH KUDERNATSCHE, Sectionsrath im Ministerium des Bergbaues und der Landeskultur.

Schriftführer—Herr HEINRICH HENKING, Ministerial-Sekretär. Commissions-Mitglieder für Nieder-Oesterreich.

Herr THEODOR HORNBOSTEL, Fabriksinhaber, Präsident der Wiener Handelskammer und des Nieder-Oesterreichischen Gewerbs-Vereines.

Herr CARL RÖSNER, Professor der Baukunst und provisorischer Präsident der k. k. Akademie der Künste in Wien.

Herr CARL RITTER v. KLEYLE, Sections-Chef und Ministerialrath im Ministerium für Landeskultur.

Herr ADAM RITTER v. BURG, k. k. Regierungsrath, Director des Polytechnischen Institutes und Vice-Präsident des Nieder-Oesterreichischen Gewerb-Vereines.

Herr PAUL SPRENGER, Sectionsrath der General-Baudirection.

Herr A. STEINHEIL, Sectionsrath im Ministerium des Handels.

Herr JACOB REGENHART, Kaufmann und Fabriksinhaber,

Herr JOHANN MAYER, Groszhändler und Fabriksinhaber,

Herr LUDWIG DAMBÖCK, Fabriksinhaber,

Herr JOSEPH ZEISEL, Fabriksinhaber,

Herr LUDWIG HARDTMUTH, Fabriksinhaber,

Herr GUSTAV HÖFKEN, Sectionsrath im Ministerium des Handels.

Herr FRANZ FREIHERR VON LEITHNER, k. k. Regierungsrath und Fabriks-Director.

Herr ALOIS AUER, k. k. Regierungsrath und Director der Staatsdruckerei.

Herr ANTON SCHRÖTTER, Professor der Chemie, Mitglied der Akademie der Wissenschaften in Wien.

Herr LUDWIG VON BREVILLIERS, Fabriksinhaber.

Herr GEORG ENDRIS, Groszhandlungs-Dirigent.

Herr THEODOR GULCHERN, Fabriksinhaber.

Herr CARL LEISTLER, Tischlermeister.

Herr MATTHAUS EDLER VON ROSTHORN, Gewerke.

Herr HEINRICH D. SCHMIDT, Fabriksinhaber.

Herr OTTO SCHUMANN, Kaufmann.

Herr Dr. WILHELM SCHWARZ, Secretär der Wiener Handelskammer.

Herr EMIL SEYBEL, Fabriksgesellschafter.

Herr JOHANN B. STREICHER, Clavermacher.

Herr ERNST WEIDINGER, Fabriks-Director.

Commissions-Mitglieder für Böhmen.

Herr FRANZ GRAF VON HARRACH, Fabriksinhaber und Präsident des böhm. Gewerb-Vereins,

Herr CARL BALLING, Professor der Chemie & Vice-Präsident des böhm. Gewerb-Vereins,

Herr JOHANN B. RIEDEL, Kaufmann & in Prag.

Vorsteher des Handelstandes,

Herr Dr. CARL KREUTZBERG, Fabriksinhaber,

Herr B. VON PARTHEIM, Fabriksinhaber.

Herr FRANZ RICHTER, Fabriksinhaber.

Herr JOHANN LIEBIG, Fabriksinhaber und Präsident des Gewerb-

Vereines, in Reichen-

Herr WILHELM SIGMUND, Fabriksinhaber.

Herr CARL FISCHER, Fabriksinhaber in Pirken-

hammer.

Herr EDUARD LEITENBERGER, Fabriksinhaber in Reichstadt.

Herr A. D. MAYER, Fabriksinhaber in Winter-

berg.

Herr M. MAYER, Bergwerks-Director in Neu-

Joachimsthal.

Herr JOH. REINHOLD, Fabriksinhaber in Warna-

dorf.

Commissions-Mitglieder für Mähren und Schlesien.

Herr HUGO FURST VON SALM-REIFFERSCHEID-KRAUTHEIM, Fabriksinhaber und Präsident der Mährisch-Schlesischen Landwirtschaftsgesellschaft.

Herr LEOPOLD HAUPT, Fabriksinhaber.

Herr FLORENTIN ROBERT, Fabriksinhaber in Selowitz.

Herr PHILIPP SCHOLLER, Fabriksinhaber in Brünn.

Herr HEINRICH ZURHELLE, Fabriks-Director in Namiest.

Commissions-Mitglieder für Galizien die Bukowina und das Gebiet von Krakau.

Herr ALFRED GRAF V. POTOCKY, k. k. geh. Rath und Fabriksinhaber.

Herr JOSEPH RUSZEGGER, k. k. Gubernialrath und Bergwerks-Director in Wieliczka.

Herr CARL HAUSNER, Groszhändler in Brody.

Herr VINCENZ KIRCHMAYER, Groszhändler, in Krakau.

Herr FLORIAN SEIGER, Groszhändler, in Lemberg.

Commissions-Mitglieder für Ungarn, Croatiens, Slavonien, Siebenbürgen die Woizodina, das Temescher Banat und die Militärgränze.

Herr GRAF JOH. BARKOTZY, Grundbesitzer,

Herr AUGUST L. KRAUSE, k. k. Cameralrath und Fabriken-Inspector,

Herr CHRIST. J. MALVIEUX, Groszhändler,

Herr SAMUEL V. JOOB, Güter-Director,

in Pesth,

AUSTRIA—*continued.*

Herr JOSEPH RITTER v. FERRO, k. k. Sections-rath und Ministerial-Commissär, in Nagy-Banya.	Herr ERNST v. MYLIUS, Grosz-handlungs-Gesellschafter,	in Mailand.
Herr CARL WALBURG, Kaufmann, in Kronstadt.	Herr ALBERT KELLER, Fabriks-inhaber,	
Herr CARL MEYNIER, Fabriksinhaber, in Fiume.	Herr JOSEPH ANT. REALI, Fabriksinhaber,	
Herr AUTON TSCHOPP, Groszhändler, in Carlstadt.	Herr PETER BIGAGLIA, Fabriks-inhaber,	in Venedig.
<i>Commissions-Mitglieder für Steiermark, Kärnthen, Krain, Triest, Görz, Istrien, und Dalmatien.</i>	Herr FERDINAND ZUCCELLI, Kaufmann,	
Herr Doctor FRANZ HLUBECK, Professor und Secretär der Steiermärkischen Landwirtschafts-Gesellschaft, in Gratz.		
Herr Dr. CARL PEINTINGER, Bergwerks-Director,		
Herr PETER TUNNER, Vorsteher der montanistischen Lehranstalt,		
Herr THOMAS RITTER v. MORO, Fabriksinhaber,		
Herr J. SCHELIESZNIGG, Bergwerks-Inspector,		
Herr HEINRICH COSTA, Oberamts-Director,		
Herr WILLIAM MOLINE, Fabriks-Director,		
Herr KALIMAN RITTER v. MINERBI, Groszhändler und Fabriksinhaber,		
Herr CARL REGENSDORFF, Groszhändlungs-Dirigent,		
<i>Commissions-Mitglieder für das Lombardisch-Venetianische Königreich.</i>		
Herr GRAFF ARCHINTI, Fabriks-inhaber,		

PRUSSIA.—A Commission formed, consisting of the following Members:—

Geheimen Ober-Finanzrath von VIEBAHN.	Geheimen Kommerzienrath CARL.
Geheimen Regierungsrath DELBRUCK.	Geheimen Kommerzienrath BAUDOUIN.
Director des Königlichen Gewerbe-Instituts, Dr. DRUCKENMULLER.	Herr F. ZIMMERMANN.
Professor Dr. SCHUBARTH.	Herr WEIGERL.
Fabriken Kommissionsrath WEDDING.	Herr OERTLING.
Fabriken Kommissionsrath BRIX.	Herr Dr. LUDERSDORF.
	Herr BIDTEL.

BAVARIA.—The Polytechnic Society of Munich.

SAXONY.—M. le Dr. WEINLIG, Conseiller intime au Ministère de l'Intérieur.

HANOVER.—Art-Union of Hanover.

WURTEMBERG.—Herr SUTTER, President of the Central Society for Industry and Trade.

NASSAU.—The Chamber of Commerce of Nassau, through its President the Assessor ODERNHEIMER of Wiesbaden.

GRAND DUCHY OF HESSE DARMSTADT.

Privy Councillor ECKHARDT, President of the Trades' Union of the Grand Duchy of Hesse.

HAMBURGH.—The Society for the Promotion of Arts and the Useful Professions.

Dr. W. A. KRAMER (*Secretary*).

BREMEN.—Dr. HENRY GRONING.

LÜBECK.—The Trades Committee of the Patriotic Society.

SWITZERLAND.—A Commission formed, consisting of the following Members:—

Dr. SCHNEIDER, of Berne (<i>President</i>).	M. JENNI, Manufacturer, of Glaris.
M. BOLLEY, Professor, of Aarau.	M. SARASIN, of Bâle.
M. COLLADON, Professor, of Geneva.	M. SULZBERGER, Manufacturer, of St. Gall.
Major COURVOISIER, Neuchatel.	M. ZIEGLER PELLIS, of Winterthur.

RUSSIA.

Two Commissions formed, one at St. Petersburgh and the other at Odessa. The Royal Commissioners to communicate with them through the Agent of the Imperial Finance Department (M. KAMENSKY), who resides in London.

SWEDEN.—M. D. C. DE SKOQMAN, Président du Collège du Commerce.

NORWAY.

M. LANGBERG, Professor of Natural Philosophy.	Captain VERGELAND, of the Artillery.
Colonel GARBN, of the Engineers.	M. SCHINNER, Architect.
M. YARBELL, Mechanician.	M. VERGMAN, Ornamental Painter.

Who together form the direction of the Society of Arts at Christiania.

DENMARK.—A Commission formed.

TUSCANY.—A Commission formed, consisting of the following Members:—

President.—The Chevalier BALDASSERONI, Minister of Finance and Commerce.	The Marquis RIDOLPHI, Deputy of the Academy of the Georgofili.
Sir G. B. HAMILTON, H.B.M. Minister Plenipotentiary at the Court of Tuscany. (Since dead.)	Mr. HORACE HALL, Deputy of the Chamber of Commerce of Florence.
Signor CORRIDI, Director of the Technical Institute of Florence.	Count F. DE LARDENEL, Deputy of the Chamber of Commerce of Leghorn.
The Chevalier BROCCHI, Ex-Director of ditto.	The Marquis MAZZAROSA, Deputy of the Chamber of Commerce of Lucca.

NAPLES.—A Commission formed, composed of Members of the Reale Istituto d'Incoraggiamento.

SARDINIA.—A Commission formed, including the Hon. RALPH ABERCROMBY, H.B.M.'s Minister Plenipotentiary at the Court of Sardinia.

SPAIN.—A Commission formed, consisting of the following Members:—

Commissioners.

EL ALMIRANTE DUQUE DE VERAGUA (President).	Don BUENAVENTURA CARLOS ARIAN.
Don SALUSTIANO DE OLOZAGA.	Don MANUEL GARCIA BAVRANALLANA.
Don ANTONIO RAMON ZARCO DEL VALLE.	Don CIPRIANO SEGUNDO MONTESINO.
Don JUAN ALVAREZ Y MENDIZABAL.	
Don ALEJANDRO OLIVAN.	
Don JOSE CAVEDA.	
Don CHRISTOBAL BORDIN.	
Don JOAQUIN ALFONSO.	
Don ANTONIO GUILLERMO MORENO.	
Don JUAN MANUEL CALDERON.	

Committee.

Don SALUSTIANO DE OLOZAGA (President).	Don SALUSTIANO DE OLOZAGA (President).
Don JUAN ALVAREZ Y MENDIZABAL.	Don JUAN ALVAREZ Y MENDIZABAL.
Don ANTONIO RAMON ZARCO DEL VALLE.	Don ANTONIO RAMON ZARCO DEL VALLE.
Don MANUEL GARCIA BAVRANALLANA.	Don MANUEL GARCIA BAVRANALLANA.
Don CIPRIANO SEGUNDO MONTESINO (Secretary).	Don CIPRIANO SEGUNDO MONTESINO (Secretary).

TURKEY.—A Commission formed, consisting of the following Members:—

President.

ISMAEL PACHA, Minister of Commerce.	Members.
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Vice-Presidents.

SALIK BEY, Assistant of the Minister of Commerce.	NEJEEB EFFENDI.
SAID BEY, Secretary to the President.	HAJJI BEKIR AGA.
M. LAFONTAINE, Secretary to correspond with England.	YUSUF HAJJAR.
	SEID MUSTAPHA EFFENDI.
	HAJJI HASHIM ZADEH EMIN EFFENDI.
	BALMOOMJI ZADEN SALIK EFFENDI.
	GORGHI ALESIOLON.
	YACOOB VARTORES.
	ELIA HAVA.

GREECE.—A Commission formed, consisting of the following Members:—

M. LUCAS RALLI, President.	Professor LANDERER.
M. SIMOS.	M. C. G. DOUROUTTI.
M. C. N. DOSSIOS.	M. G. P. SCUZÉS.
M. le Capitaine G. TOMBASIS.	M. DOMANDO.
M. L. CAFTANGIOGLU.	M. S. A. SPILIOVAKIS, Secretary.

PERSIA.—The MELLIK-OOT-TOOJAR, Chief of the Merchants.

CHILE.—The following Gentlemen have been appointed to correspond with the Commission in London:—

Don PEDRO NOLASCO MENA, Chairman of the Society of Agriculture and Beneficence.
Don IGNACIO DOMEYKO, Professor of Chemistry.
Don JULIO JARRIEZ, Director of the School of Arts and Trades.

PERU.

The Minister of the Home Department (<i>President</i>). Don LUIS FONCECA.	Don NICOLAS PIEROLA. Don NICOLAS RODRIGO.
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VENEZUELA.

A Commission formed. The Royal Commissioners to communicate through Mr. MILLIGAN, Consul-General for the Government of Venezuela.

UNITED STATES.

The National Institute, in conformity with the wish of the Government, have appointed the following Gentlemen to form a Central Committee to correspond with the different Societies and Local Committees throughout the United States.

Hon. MILLARD FILLMORE, President of the United States, Chancellor of the Regents of the Smithsonian Institution.

Colonel PETER FORCE, President of the National Institute.

Hon. JAS. A. PEARCE, United States' Senate, Member of the Board of Regents of the Smithsonian Institution.

Hon. LEVI WOODBURY, Member of the National Institute, Associate Justice of the Supreme Court of the United States.

Commodore LEWIS WARRINGTON, United States' Navy, Member of the National Institute, Chief of the Bureau of Ordnance and Hydrography.

Professor JOSEPH HENRY, Vice-President of the National Institute and Secretary of the Smithsonian Institution.

Professor WALTER R. JOHNSON, Corresponding Secretary of the National Institute.

Professor ALEXANDER D. BACHE, Member of the National Institute, Member of the Board of Regents of the Smithsonian Institution, and Superintendent of the Coast Survey.

Commander CHARLES WILKES, United States' Navy, Member of the National Institute, late Commander United States' Exploring Expedition.

Hon. W. W. SEATON, Member of the National Institute, Mayor of Washington.

Hon. JEFFERSON DAVIS, United States' Senate, Member of the Board of Regents of the Smithsonian Institution.

Lieutenant MATTHEW F. MAURY, United States' Navy, Vice-President of the National Institute, and Superintendent of the National Observatory.

CHARLES F. STANSBURY, Esq., Recording Secretary of the National Institute.

J. JAMES GREENOUGH, Esq., Member of the National Institute.

Colonel J. J. ABERT, Member of the National Institute, Chief of the Topographical Bureau. General Jos. G. TOTTEN, Vice-President of the National Institute, Chief Engineer United States' Army.

THOMAS EW BANK, Esq., Commissioner of Patents. WILLIAM EASBY, Esq., Treasurer of the National Institute.

DR. LEONARD D. GALE, Member of the National Institute, Examiner of Patents.

J. C. G. KENNEDY, Esq., Member of the National Institute, Superintendent of Census.

EZRA C. SEAMAN, Esq., Member of the National Institute.

Professor WALTER R. JOHNSON (*Secretary*).

FOREIGN ACTING COMMISSIONERS.

AMERICA, UNITED STATES OF . . .	EDWARD RIDDLE. N. S. DODGE, Secretary.	NETHERLANDS . . . G. GOOSSENS.
AUSTRIA . . .	Chevalier DE BURG. CHARLES BUSCHEK.	PORTUGAL . . . F. J. VANZELLER.
BAVARIA . . .	Professor Dr. SCHAFHAUTL.	ROME . . . Sr. CARLO TREBBI.
BELGIUM . . .	CHARLES CUYLITS.	RUSSIA . . . GABRIEL DE KAMENSKY.
BRUNSWICK . . .	Professor VARENTRAPP.	SARDINIA . . . Chevalier LENCISA.
DENMARK . . .	REGNAR WESTENHOLZ.	SAXONY . . . Dr. W. SEYFFARTH, LL.D.
DUCHY OF NASSAU . . .	HERR ASSESSOR ODERNHEIMER.	SPAIN . . . Don M. de YASASI. Don RAMON DE LA SAGRA. Don RAMON ECHIVARRIA. Don J. VILLANUEVA.
EGYPT . . .	Capt. ABDUL HAMED.	SWEDEN & NORWAY CHARLES TOTTIE.
ELECTORATE OF HESSE CASSEL . . .	HERR ASSESSOR SCHREIBER.	SWITZERLAND . . . Dr. BOLLEY. Professor COLLADON.
FRANCE . . .	SALLANDROUZE DE LAMORNAIX.	TUNIS . . . Sig. HAMDA ELMKADDEN.
FRANKFORT . . .	M. P. ELLISSEN.	TURKEY . . . EDWARD ZOHRAP.
GRAND DUCHY OF HESSE . . .	M. RÖESSLER.	TUSCANY . . . Professor P. CORRIDI.
GREECE . . .	M. RALLI.	WURTEMBERG . . . Dr. STEINBEIS. CHARLES BRAND. M. SCHIEDMAYER.
HAMBURGH . . .	M. NOBACK.	ZOLVEREIN . . . M. VON VIEBAHN,
HANOVER . . .	M. STAHL SCHMIDT.	

DEPARTMENTS OF THE EXHIBITION DURING THE ARRANGEMENTS.

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 Count DE LABORDE—*France*.
 C. NEWTON.
 A. PANIZZI (Reporter)—*Tuscany*.

A. W. PUGIN.
 M. QUETELET—*Belgium*.
 RICHARD REDGRAVE, R.A.
 M. SEURMONDT—*Holland*.
 M. G. Von VIEBAHN (Chairman)—*Zollverein*.
 Dr. C. WAAGEN—*Zollverein*.
 W. WYON, R.A.

THE CONSTRUCTION OF THE BUILDING.

HAD circumstances determined that the present industrial position of England should have been represented by the building alone, while other nations should have been allowed to indicate the scope of their resources by a display of choice specimens of all the varied branches of productions to which their efforts had of late years been directed, it is singular to remark how few elements, essential to her commercial success, would have been lost sight of. The courage of her citizens would have been manifested in the vastness of the scheme, their energy, determination, and strength, in the surprising rapidity with which every operation had been carried on.

The happy condition of the liberty of the subject would have been attested by the circumstance of its having been in the power of the people alone to will the existence of so vast a structure; while the fact that the whole expenses had been provided for without in any way trenching on the national resources, would have evidenced at once the wealth and the spirit of enterprise common to every class of society.

That it should have been possible in any country to have so speedily collected such a vast quantity of materials, without previously sounding the note of preparation, would have furnished strong evidence of the abundance of its native resources, and conveyed some faint idea of the extent of the stores of raw material kept ever ready to supply the exigencies of sudden demand. That that raw material should have been moulded into forms so various, so complex, and so original, in so short a time, would argue that such a result could alone have been effected by the natives of a country in which a knowledge of the principles and practice of mechanics and machinery had been long deeply studied and widely diffused. The facility with which the machinery employed must have been brought to bear upon the masses of raw material supplied, would have evidenced a power to produce, and to elaborate matter into manufacture, of the very highest order; while the grace with which the charm of decoration has been superadded, to so utilitarian a structure, would have served to show, that mindful as the English habitually are, of the practical and economical, they are by no means indifferent to the beautiful in the Fine Arts.

Whoever had been enabled to trace through every stage the progress of the Exhibition Building, from the first order given by the contractor, to the issue of the final directions for its opening, would have had an opportunity of realising the perfection to which the practice of connecting commercial co-operation in supply,

The present
industrial posi-
tion of England
indicated by the
building, as well
as the leading
characteristics of
her citizens,

both personal

Evidence given by
the building of
extent of national
resources in the
production of
Raw Material,

Machinery,

Manufactures,

and objects of
Fine Arts.

Organization of
labour, and co-
operation in sup-
ply, developed by

great engineering works.

Combination and division of labour necessary to carry out such works.

and mutual reliance in money and time bargains, with the methodical organization of labour, has been carried in England at the present time. It is by means of the experience acquired in the conduct of the vast engineering works which have of late years occupied the attention, and commanded the labours of some of her most intelligent citizens, that this country has been enabled to reduce to a perfect system this power of subordinating the supply of materials, and of eliciting, in similar works, that precise description of labour from every individual, for which his natural characteristics or education may have specially qualified him.

The firm through whose exertions the building has been erected, in itself presents an excellent model of the commercial constitution necessary to produce such great works with rapidity. While of its heads, one is remarkable for high scientific attainments, another possesses singular commercial aptitude, together with a minute knowledge of the working details of his business. Others again, bring to the common stock of intelligence a precise knowledge of legal and monetary transactions, together with experience acquired in many years' connection with speculations of great magnitude. The principal superintendents and foremen set in operation by this intellectual motive power, are each adapted to the particular duties they may be called upon to perform, and act precisely as the various portions of a well-devised machine, being at the same time maintained in as perfect control. Through these agents the labour of the artisan, skilled in his own department, profoundly ignorant in others, is brought into useful operation; and thus thousands are combined to realise the will of one directing mind. But for the perfect system of discipline, which frequent practice in directing the labours of masses of workmen has now made general throughout England, it would have been impossible to have fashioned, in so short a time, so novel and so vast a structure as this Temple of Peace, the gates of which may, we trust, be thrown open to the world at large, for many years to come.

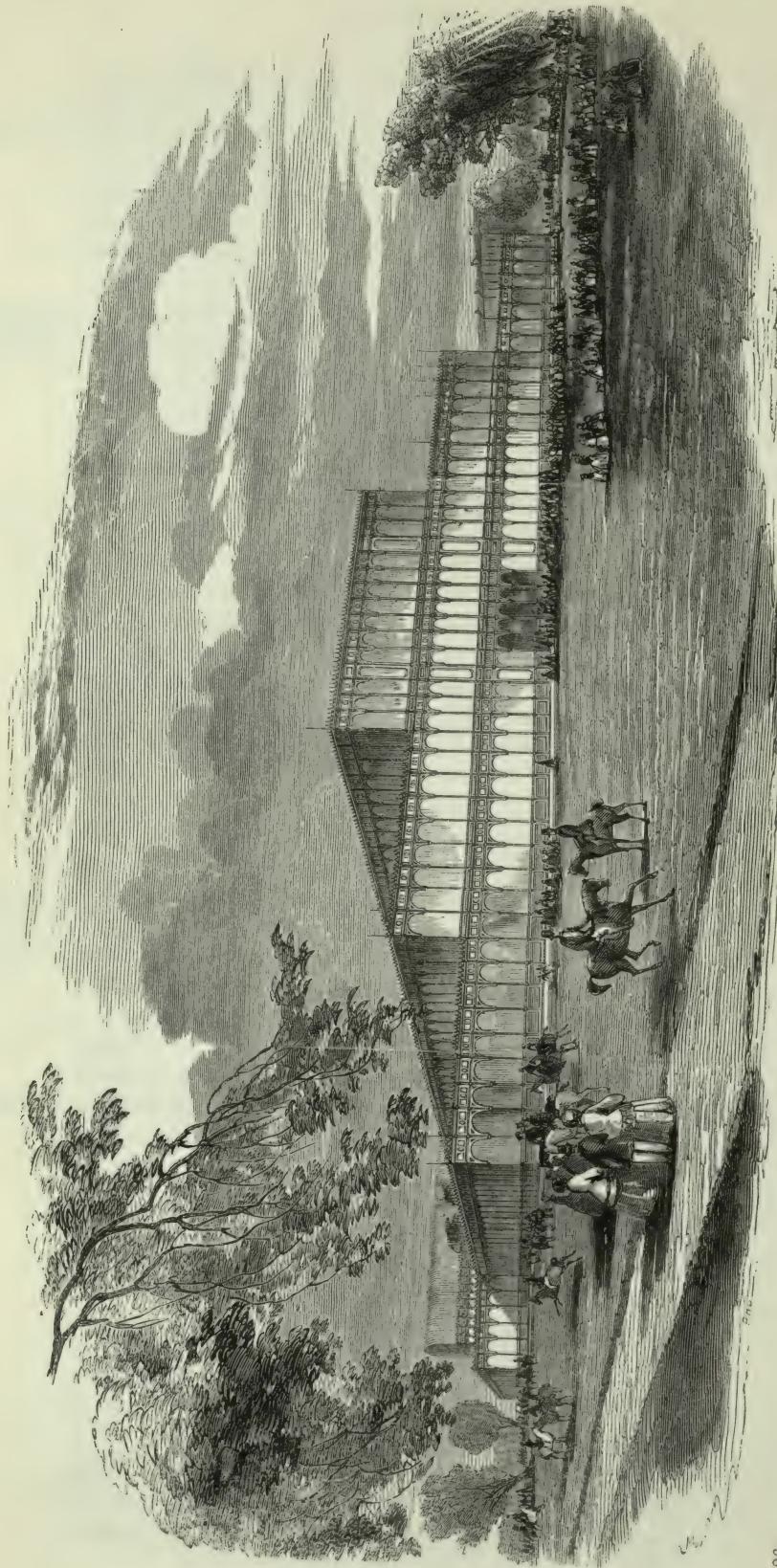
Division of the subject into—
 I. The building as it stands.
 II. Its creation.

How far the Exhibition Building conveys a true idea of English constructive power, can only be ascertained by a minute examination of its anatomy; and we shall therefore proceed to sketch in some detail its actual nature and appearance, and the successive steps by which it has grown into its present condition.

The site in Hyde Park.

The site for the building is the one originally proposed for it by H.R.H. PRINCE ALBERT at the first private meeting, held on the subject of the Exhibition, at Buckingham Palace, on the 30th June, 1849. It consists of a rectangular strip of ground in Hyde Park, situated between the Queen's Drive and Rotten Row, and contains about 26 acres; being approximately 2,300 feet in length, by 500 feet in breadth. Its principal frontage extends from east to west. Several lofty elms stretch across the centre of its length, and a few smaller trees are scattered over its area. These trees have for the most part been retained, and to the finest of them we are indebted for the existence of the beautiful transept roof; since, had they not presented difficulties to the construction of a roof of lower pitch, it is more than probable that the noble vault which now spans them would have been scarcely ventured on. The ground, although apparently level, actually falls, not less than 1 in 250 from west to east. From the popularity of the spot, the ease with which it can be approached, the opportunities for obtaining beautiful views of the building from every direction, and the facility with which it has been drained, and supplied with gas and water, it is scarcely possible that a site could have been found more admirably adapted for such a purpose, than the one upon which the building now stands.





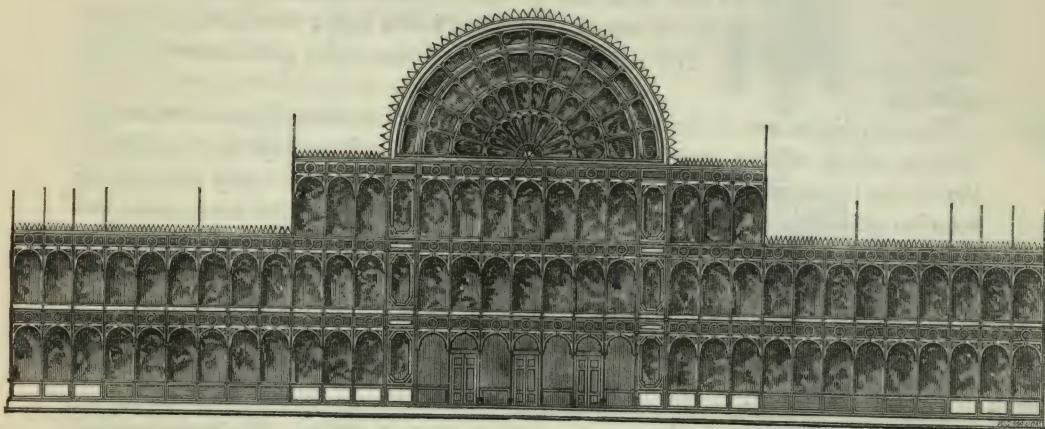
[Fig. 16, p. 67.

VIEW OF THE EXTERIOR OF THE BUILDING FROM THE NORTH-WEST ANGLE.

The principal entrance to the Exhibition is situated in the centre of the south side, opposite to the Prince of Wales's Gate, one of the main entrances to Hyde Park. From this gate a good view of the southern façade of the transept (shown in fig. No. 1) is obtained. Passing through a vestibule, 72 feet by 48, the

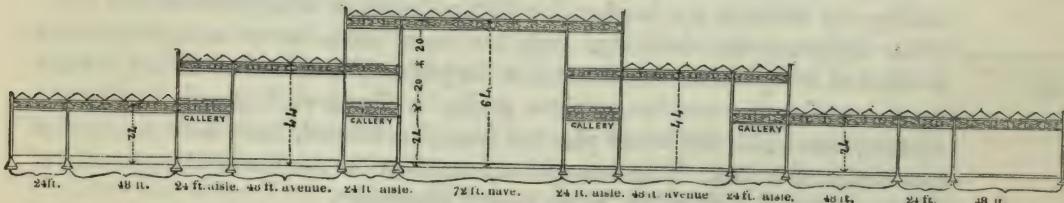
*The Building :—
Its principal entrance;*

Fig. 1.



visitor finds admittance to the main building, and stands beneath the roof of the great feature of the whole, the transept. Above his head, at a height of 68 feet from the ground, springs a semi-cylindrical vault, 72 feet in diameter, which extends for a length of 408 feet from south to north. On each side of the space *The "coup d'œil" on entering;* so covered, runs an aisle 24 feet wide. The "coup d'œil" afforded by the transept is represented in Plate I.

Fig. 2.



Advancing about halfway along the transept, the visitor will find himself as nearly as possible in the centre of the building; and from this point his eye may range eastward and westward along its vast nave, for a distance of upwards of 900 feet in each direction; the total length of the building being not less than 1848 feet. By reference to the ground plan given at page 1, and to fig. 2, a clearer idea may be formed of the manner in which the vast area, that thus opens itself to the view, has been distributed, than could be conveyed by many pages of description. The nave is a grand avenue 64 feet high and 72 feet wide, crossing *Its extent,* the transept at right angles. On each side of it extend aisles 24 feet in width, and above them, at a height of 24 feet from the ground, are carried galleries, surrounding the whole of the nave and the transept; so that a complete circuit of communication is carried throughout the whole structure at that level.

Beyond these first aisles, and parallel with them, at a distance of 48 feet, are *and divisions on plan.* second aisles of similar width, and similarly covered for their whole width with galleries on the same level as those over the first aisles. In order that the

public may pass freely from one line of galleries to the other, bridges, at frequent intervals, span the 48 feet avenues, and at the same time divide them into courts, each of which has been so arranged as to present an "ensemble" to the eye of the spectator looking down upon it from the galleries. The width of 48 feet which we have described as thus subdivided, and the second aisles, are roofed over at a height of 44 feet from the ground. The remaining portion of the building in width consists of one story only, 24 feet high; in which, of course, there are no galleries. Ten double staircases, 8 feet wide, give access to these galleries.

Its lightness of proportion,

no evidence of instability.

General nature of materials.

Quantities of wrought iron;

Cast iron;

Glass;

Wood.

The plan divided into squares of 24 feet.

Necessity of realizing the detail of one 24-feet bay, in order thereby to judge of the whole area.

The description of a 24-feet bay commenced.

The foundations.

The airy lightness of the whole structure, and its immense dimensions, are the features which will no doubt first excite the wonder, and perhaps the timidity of the visitor; but when he learns how rigidly the strength of every portion has been investigated, with what care the connection of every part has been made, and that the whole of that which appears to him so complicated, is but the repetition of a few simple elements, he will throw aside alarm, and rest upon the consciousness that those most competent to investigate questions of force to overturn, and strength to resist, have spared no pains to assure themselves of the perfection of the parts, and the consequent stability of the whole.

The lightness of the proportions will at once assure the spectator of the nature of the material which forms the main supports of the building. While the vertical supports consist entirely of cast-iron, the horizontal connections and girders are constructed of both wrought and cast iron. Of wrought-iron it has been estimated that no less than 550 tons have been used, and of cast-iron 3,500 tons. The whole of the roof, above the highest tier of iron frame-work, consists of wood and glass, and the external enclosures and face-work are constructed almost entirely of the same materials. It is estimated that 896,000 superficial feet of glass, weighing 400 tons, have been employed; whilst the quantity of wood used, including the whole of the flooring, has been no less than 600,000 cubic feet.

In designing the building, care has been taken so to arrange that the position of every column shall occur at the points of intersection of lines, 24 feet apart, crossing one another at right angles, while in roofing and flooring the squares, into which the whole plan has been thus allotted, have been subdivided into others of 8 feet. This arrangement accounts for the beautiful regularity of the lines of the columns, &c., when viewed diagonally.

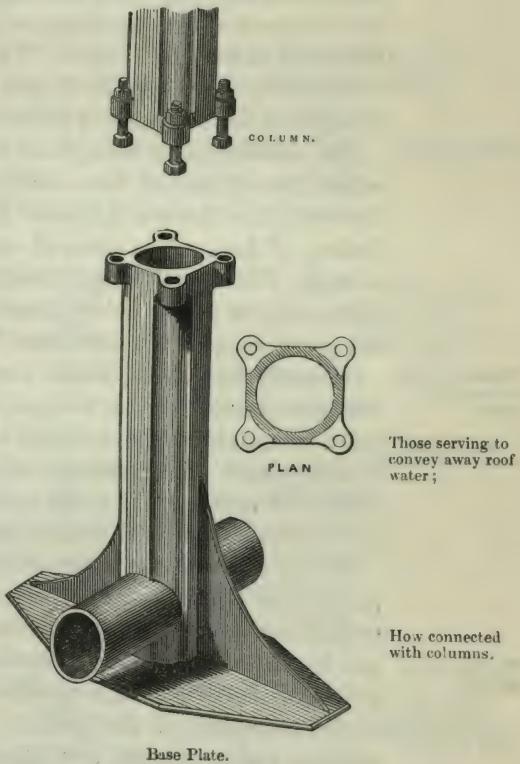
In order to afford some idea of the extent of mechanical difficulties involved in the erection of such a building, and to furnish, as it were, a scale by which to estimate the nature of the work, we shall proceed, before entering upon the subject of its general extent and arrangement, to describe the mode of construction of one of the 24-feet bays or compartments, taken at random from the side aisle adjoining the main avenue.

The exact situation of the four columns enclosing the space referred to having first been determined, holes were dug to such a depth as to lay bare the gravel; which extends, with scarcely a fault, over the whole surface of the site, at an average depth of between 2 and 4 feet. The size of the holes dug out for the foundations, and the quantity of concrete thrown into those holes in order to form a secure foundation for the superstructure, was determined by the estimated weight of that superstructure; and it was so arranged that, allowing for every possible contingency, under no circumstances should a pressure greater than $2\frac{1}{2}$ tons per foot superficial be brought to bear upon the foundation.

On the surface of fine mortar, with which the concrete was covered, was placed a casting, which has been technically called a *base-plate*. This casting is represented in fig. 3. The lower part consists of a horizontal plate, having attached to it a vertical tube, corresponding in form with the column which it serves to carry. The connection of the plate with this tube is strengthened by shoulders. The length of the whole of the base-plates being set north and south, in those through which roof-water is conducted, two sockets, issuing from the lower part of the tube, extend for some distance on each side in an opposite, or eastern and western direction. Into these sockets cast-iron pipes 6 inches in diameter are inserted, serving as drains to convey away the water; which, passing through the columns above, and through the hollow tubes of the base-plates, escapes into the pipes referred to, and finds its way to capacious drains situated in the centre, and at the extreme east-end of the building, which, in their turn, convey the water to the main sewer in the Kensington-road. At the upper portion of the tube of the base-plate, four projections with holes in them, are cast. At the foot of the column, which is of similar form to the base-plate, are similar projections, with corresponding holes. The upper face of the tube, and the under face of the column, being planed perfectly flat and true, the holes cast in the projections of the one exactly fit those cast to correspond with them in the other. Bolts having been then dropped through the holes in both are secured by nuts; and thus the column is attached to the base-plate, almost as rigidly as if the two had issued from one mould. As a proof of the singular accuracy with which the whole of these base-plates have been set upon their foundations, it may be mentioned that in every instance, the holes in the upper face or bearing surface of the base-plate, have precisely corresponded with those cast in the under face of the columns, at the exact height at which it had been pre-arranged that they should be fixed; and the two (columns and base-plates) have been united without involving the necessity of inserting any packing between them. Pieces of canvas only, cut to the exact form of the bearing surfaces, and dipped in white lead, have been interposed, with a view to insure the joints remaining perfectly secure and water-tight. The tops of the base-plates rise $3\frac{3}{4}$ inches above the ground-floor.

The columns are 8 inches in diameter, and those on the ground-floor are 18 feet The columns: $5\frac{1}{2}$ inches high. The plan or horizontal section of these columns, which was the suggestion of Mr. BARRY, is well adapted for its purpose, mechanically as well as artistically; for while it presents a pleasing variation from the ordinary circular form, the different flat bands upon it afford surfaces well suited for the con-

Fig. 3.



nection and attachment of the necessary girders, which serve at once to support the galleries and roof, and to tie the various compartments of the building into one vast network. The columns are made hollow, in order to convey the water from the roof of the building; and the thickness of the metal of which they are composed varies, according to the weight each column is intended to support, from $\frac{3}{8}$ of an inch to $1\frac{1}{8}$ inch. The square faces already mentioned add, however, considerably to the sectional area of the metal, upon the amount of which the strength of the column in a great measure depends.

Their strength;

The extraordinary strength to resist compression in the direction of its length, which the cylindrical form conveys to any material, was illustrated by Professor COWPER, in a lecture delivered by him in the building to the members of the Society of Arts. In a series of experiments with a common quill, and even with a straw, Professor COWPER demonstrated the great force required to crush such slight objects, and, arguing from their comparative scale, illustrated satisfactorily the great strength of the columns in the building.

Their attachment to connecting-pieces.

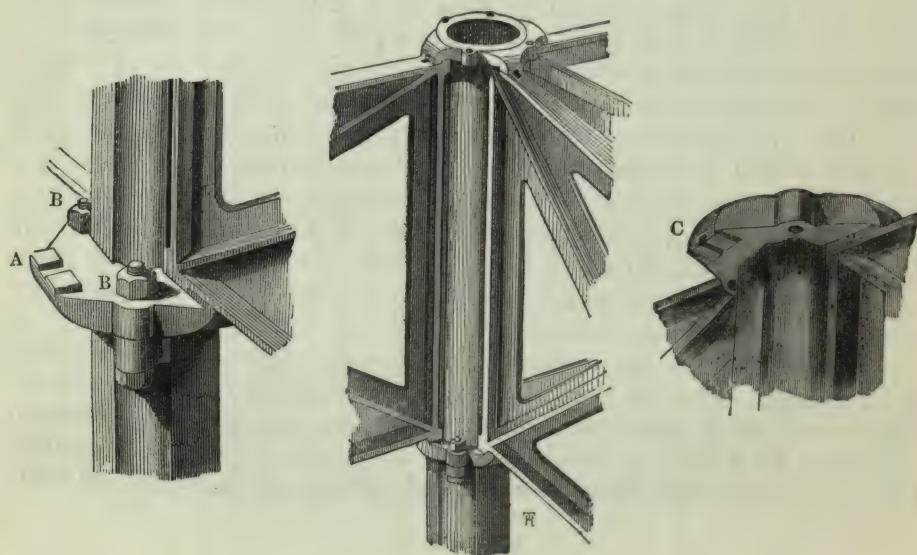
Beneath the capital, which surrounds the upper part of the column, are concealed projections similar to those at the bottom of the column. These projections serve to attach to the columns what have been technically designated as connecting-pieces. The peculiar office of the connecting-pieces is to afford, by a small and consequently easily modified casting, the means of securely retaining, and connecting in all directions, the various girders throughout the building.

The connecting-pieces;

The attachment to them of girders

In fig. 4, we have endeavoured to exhibit the peculiar formation of those portions of the connecting-pieces, which serve to effect the end desired. The projections, or, as they are technically termed, "snugs," are cast upon the upper and lower portions of the connecting-pieces, and act partly as brackets and partly as hooks, clutching over, supporting, and retaining, projections cast upon the ends of the standards of the girders. In order to retain the girders in a vertical position, and to prevent any lateral movement, the bottom face of that portion of the girder which rests upon the corresponding projection of the connecting-piece, is formed with what is called a tenon, which drops into a mortice-hole (A, fig. 4), cast in the face of the projection of the connecting-piece with which it comes in contact. The top face of the portion of the girder, over which the hook cast upon

Fig. 4.



the upper portion of the connecting-piece extends, has a groove sunk upon its surface; a groove corresponding to it in width is also sunk upon the projection of the connecting-piece (C, fig. 4), and a small piece of iron is introduced between the two. This iron acts as a key or dowel, and prevents the two surfaces sliding upon one another.

On the upper and lower part of the connecting-piece, between these projections which serve to retain the girders in their places, are cast holes, corresponding with those at the top of the lower columns, and at the bottom of the upper columns; through which bolts being inserted, nuts (BB, fig. 4), fastened to those bolts, secure the columns and connecting-pieces together. A similar arrangement would enable any number of columns and connecting-pieces to be attached to one another, so as to make up one long length.

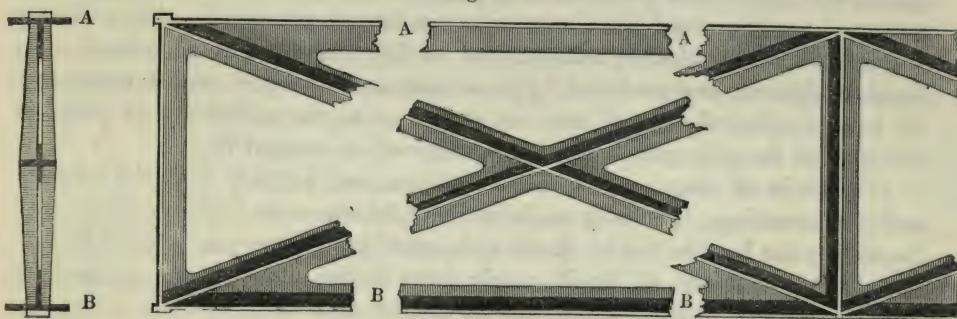
In order to make sure that the shaft thus composed of alternate columns and connecting-pieces, should be capable of maintaining itself in a perfectly vertical position, it was necessary that the whole of the surfaces of contact should be wrought perfectly true and flat. Every column and every connecting piece had, therefore, to be placed in a lathe; and the bed or surface at each end faced to a perfectly true plane. When the number of these columns, base-plates, and connecting pieces is taken into consideration, it may be easily imagined that the labour entailed by this apparently simple necessity could scarcely have been performed in any workshops but those provided with extraordinary facilities and resources.

In the connecting pieces of the 24-feet bay we are now describing, projections are cast upon three sides, so that girders may be attached in three directions; and thus extend in every direction except that towards the nave, and the 48-feet avenue or court on the other side.

The girders, which are attached, as above described, to the connecting pieces, serve to support the gallery floor. As, in the construction of this floor, it had been determined to bring the accumulation of pressure on the girders, upon points at 8 feet intervals, it became necessary, in arranging the form of the girders, to concentrate strength at those points. The vertical lines of the girder have, therefore, been arranged to occur at intervals of 8 feet, connecting the top and bottom tables; on the good proportion of which, to the load to be supported, and to one another, the main strength of the whole depends. Diagonal lines connect the junction of these standards with the top and bottom tables, and the principal parts of the girder present the form shown in Fig. 5.

The girders are 3 feet deep, and the sectional area of the top table, (A, fig. 5,) which is of the T form, equals 5.31 inches, and that of the bottom, (B, fig. 5,) which is of a similar shape, but inverted, equals 7.64 inches. The areas of

Fig. 5.



Serving to stiffen shafts, consisting of alternate columns and connecting-pieces.

All bearing faces planed in lathes.

The girders supporting gallery floor;

the diagonal struts or standards, and ties, average 3·50 inches. The breaking-weight of the girders is calculated, and has been proved by various experiments, to amount to not less than 30 tons. Every one of the gallery-girders which has been used has been proved upon the ground to a strain of 15 tons; and, in exceptional cases, where it has appeared reasonable to expect that an accumulation of weight would have to be borne, their dimensions of thickness have been increased, and the amount of proof has amounted to no less than 22½ tons.

Their sufficiency

to support a
"dead weight,"

and a moving
load.
How tried:—

By workmen;

By soldiers
marching

By rolling round-
shot "in situ;"

Who made by.

A few simple figures will clearly exhibit the sufficiency of these girders to support the loads that are likely to be brought upon them. A bay of gallery-floor, measuring 24 feet by 24 feet, contains 576 square feet; and it has been found by experiment, that it is impossible to load any surface with men to an amount equal to one hundred-weight per foot superficial. Assuming, then, 576 cwts., or say 30 tons, to be by any possibility accumulated upon such a bay of gallery-floor, the load will be distributed over four girders, any two of which have been found to be fully competent to support the load.

In thus estimating the sufficiency of the girders, the load they might possibly be called on to support has been considered only as what is called "dead weight," or load to which no momentum of any kind had been imparted. In order, then, to test them under the action of a moving weight as well, a series of experiments was instituted. A perfect bay of gallery, 24 feet square, was constructed, with connecting pieces, girders, flooring, &c., complete. Its surface was first crowded with the contractors' workmen, as tight as they could be packed. The men were then set to walk over it, run over it, and, finally, to jump upon it with all their force.

In order further to observe the effects which would be produced by a load to which a uniform, instead of an irregular motion, had been conveyed, a number of soldiers of the corps of Royal Sappers and Miners were ordered to march over it, to run over it, and, finally, to mark time upon it in the most trying manner. The result of these experiments developed the correctness of the theory upon which the dimensions of the girders had been based, since not the slightest damage was done to the bay of gallery; and the fact was fully evidenced, that the quality of elasticity or springiness in the floor served to protect the girders from the effect of sudden shocks, and prevented the danger of the communication to them of the accumulating momentum, generated by the possible isochronous movements of a crowd.

Emboldened by the satisfactory result of these experiments, a yet more conclusive series was instituted. An apparatus was contrived by Mr. FIELD, the late President of the Institution of Civil Engineers, by means of which it was possible to draw, at a quick walking pace, over the whole of the galleries on which the public would have to tread, a number of 68-pounder shot, collected together so as to produce a uniform load of 100 lbs. per foot superficial. No damage whatever was produced by these rude tests, and they may be considered to have conclusively set at rest any doubts as to the sufficiency, in point of strength, of the gallery-floor, or of the girders which support it.

The whole of these girders are of cast-iron, and, together with the columns and similar castings, have been made in Staffordshire, at the foundries of the contractors, at the London Works, Smethwick, near Birmingham; at those of Messrs. A. and B. COCHRANE, of the Woodside Iron Works, Dudley; and at those of Messrs. JOBSON's, of Holly Hall, near the same town.

The floor, which is supported by these girders, consists of cross-beams, so under-trussed with iron rods, shoes, and struts, as to distribute the whole weight that may be brought upon the floor pretty equally upon the eight points at which the ends of the beams rest upon the girders. Joists, stretching from the iron girders to the beams, and from one of the beams to the other, form the supports for a floor which is not more than $1\frac{1}{2}$ inch thick, but is at once amply strengthened, and rendered impervious to the passage of dust, by the insertion, in a groove cut in the edge of each floor-board, of iron-hooping, forming a tongue. A railing, designed by Mr. OWEN JONES, surmounted by a mahogany handrail, adds at once to the utility and the beauty of the gallery.

The gallery floor resting on the girders.

The columns which rise at the gallery level are 16 feet $7\frac{1}{4}$ inches long, and are surmounted by connecting pieces, similar in all respects to those occurring beneath. To these connecting pieces are attached, transversely in one direction and longitudinally in two, cast-iron girders of similar form and scantling to those we have described; their office being to maintain perfectly true and rigid, the vertical shafts which carry the eye upward in one unbroken line from the ground to the roof which they serve to support.

The columns between galleries and roof.

As the strength of an iron column practically depends upon its length being limited, far more than upon its substance, the value of dividing the whole length of the shafts reaching from the gallery to the roof into two parts by these connecting-pieces, and thus reducing the length of the columns one-half, must be *First tier*.

Above the second tier of girders rise columns of the same length as those last mentioned, and on them again are placed connecting pieces, to which the girders supporting the roof are attached. These girders correspond with those supporting the galleries, and exactly resemble those forming the tier immediately beneath them, in every respect except their thicknesses. The whole of the girders on the upper tier have been proved in the building to a strain of nine tons.

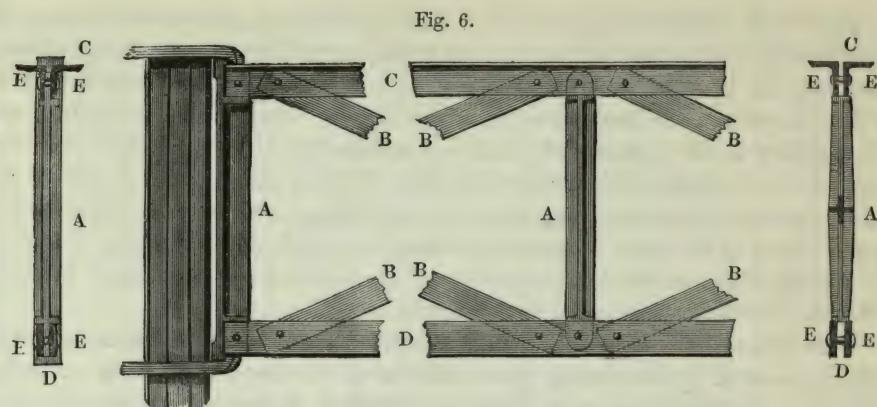
By extending the area of our observations, we shall be enabled to include all the varieties of trusses employed to support the flat roofing over the whole extent of the building. It may be well, therefore, to consider that our original limitation to 24 feet square has been enlarged by the addition of a space of 72 feet by 24 feet, being a compartment of the roof over the nave; and of an area of the same *width* by 48 feet, being a portion of the roof over the avenue which extends from east to west, beyond the aisle on each side of the nave.

Varieties of roof trusses.

As we have stated that the latter of these portions of the building (the 48-feet *avenue*) rises to a height of two stories only from the ground, it will be manifest that its roof-trusses must be attached at the level of the girders which serve to stiffen the main shafts of the nave, namely, at a height of 44 feet from the ground. These 48-feet roof-trusses are attached to connecting pieces in a similar mode to that already described for the girders, with the exception that their vertical position is maintained by bolts passing through their standards and through the column, instead of by the system of keys as in the 24-feet girders.

In fig. 6 a representation is given of the principal parts of one of these trusses, which, it will be seen, is constructed for the most part of wrought iron; the few portions which are of cast iron acting only under compression. These trusses follow the general principle of division into 8-feet compartments; and, consequently, the cast-iron struts or standards (A A A A, fig. 6) occur in positions corresponding with those in the gallery-girders already described.

Their details of construction.



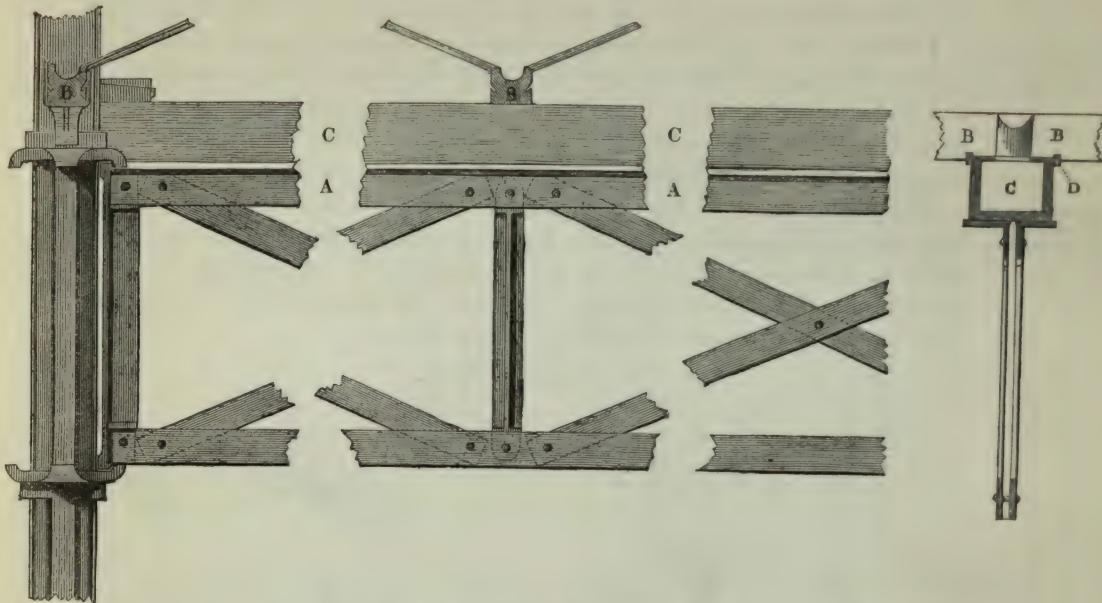
Diagonals of similar width on face (B B B B B B, fig. 6) connect them, and, consequently, an uniform lattice-like effect is obtained. The top table of these trusses (C C C, fig. 6) consists of two pieces of angle-iron, set at the distance of an inch apart, their total sectional area equalling 3 inches. The bottom table (D D D, fig. 6) consists of two bars of wrought-iron set at a similar distance apart, and increasing in sectional area up to 3.38 inches, as they approach the centre of the bearing. Between the angle-irons at the top and the bars at the bottom of the truss, are passed the ends of the cast-iron standards and those of the diagonal ties; the sectional area of the principal of the latter equalling 2.75 inches. Rivets, (E E E, fig. 6,) passing through the angle-irons and bars, the standards, and the ties, connect the whole into one truss, which acts upon the principle of a rigid top table under compression, and a suspension-truss beneath; so pressing up the standards or struts as to raise the centre of the upper table to a camber of 4 inches, one of the objects of which is to provide a sufficient fall for the roof-water. One of these 48 feet trusses, complete, weighs about 13 cwt., and when, under proof, having been loaded with a dead weight of 10 tons, deflected 3 inches, perfectly recovering its elasticity upon the removal of the weight.

The 72-ft trusses; The clear width of the nave being 72 feet, it was of course imperative to construct a third description of truss, the depth of which should not exceed that of the connecting pieces generally throughout the building, namely, 3 feet, and yet sufficiently strong to support the larger weight of roof due to the increased area of roofing it was called upon to support. The construction of this larger truss, as shown in fig. 7, corresponds in every essential particular with that of the 48-feet truss already described, with the difference that the scantling of the angle-irons and bars is necessarily much increased, and that the total length of 72 feet is divided into *nine* 8 feet lengths instead of *six*. The weight of one of these trusses complete is about 35 cwts.; the sectional area of the two angle-irons (A A, fig. 7) being 5.71 inches; that of the two bottom bars, at their maximum, 6.75 inches; and that of the principal diagonal ties 3.38 inches. When loaded under proof, with a dead weight of 16 tons, it deflected $6\frac{1}{2}$ inches, and entirely recovered its elasticity on the weight being removed.

The extra strong 72-feet trusses; their details of construction.

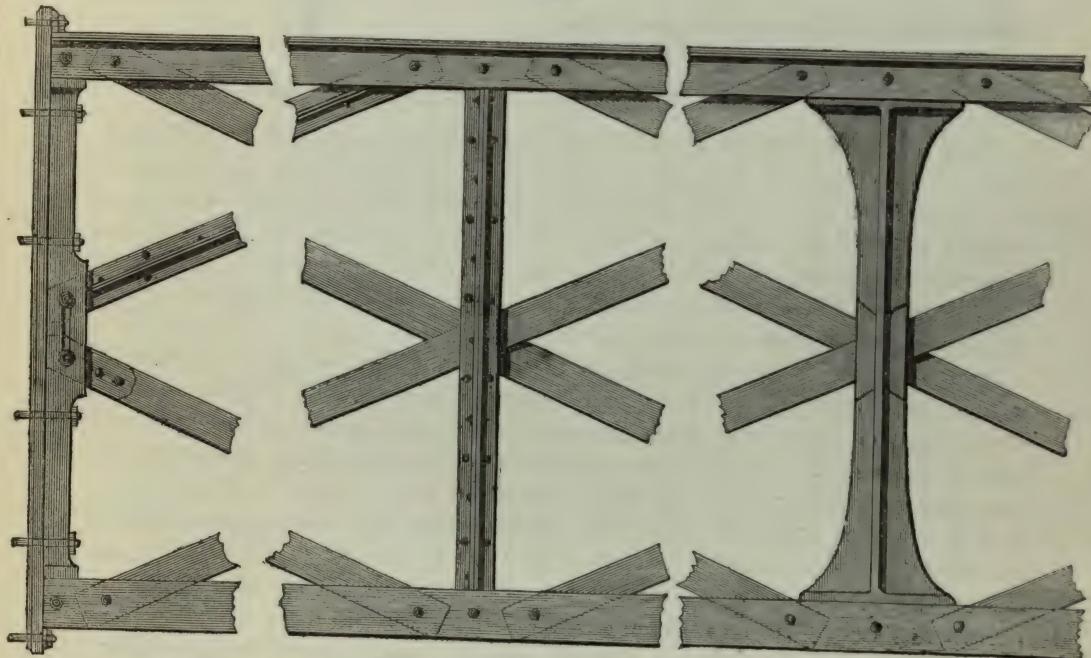
A repetition of one or other of these varieties of trusses suffices to support any portion of the flat roof of the building; but in order to carry the great extra weight thrown by the transept roof upon the last 72-feet trusses of the nave, where it intersects the transept, it was found necessary to employ trusses of double depth, extra lattice-work, and much increased scantling. The construction

Fig. 7.



of these trusses is shown in fig. 8. In order to give additional support to them, four extra columns have been attached to those situated at the intersection of the nave and transept.

Fig. 8.



The direction of the 72-feet trusses of the roof of the nave being of course transverse to its length, and the trusses occurring at intervals of 24 feet, it became necessary, in order to perfectly steady them, that timbers (shown in section and elevation at B B, fig. 7) should be thrown across from one to the other, in The roof trusses,
how connected
longitudinally.

the direction of from east to west. These timbers are introduced at intervals of eight feet, being placed directly over the vertical standards of the roof trusses.

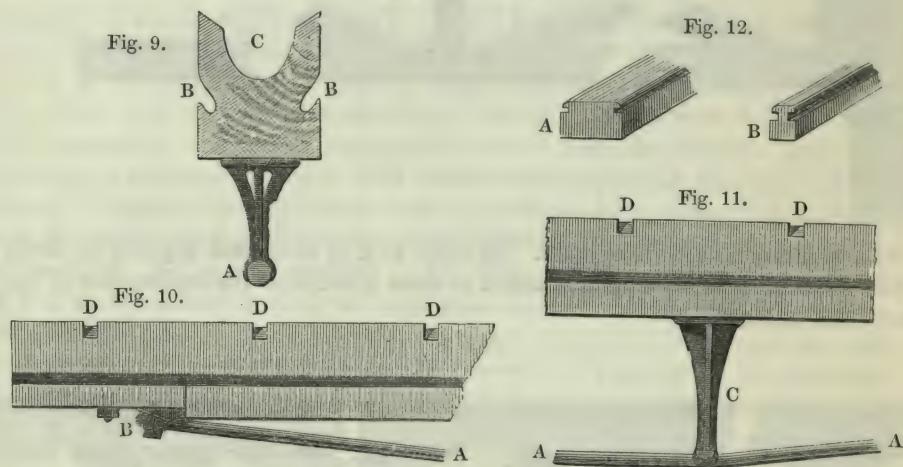
Box-gutters running transversely over trusses,

Between the top of the truss and the end of these timbers is placed a box (shown in section and elevation at C C C, fig. 7), running along the whole length, and attached to the upper flange of the truss, forming a gutter of considerable capacity, for the purpose of carrying the water away from the roofs to the hollow columns, through which it ultimately descends to the drains.

Connected longitudinally by Paxton gutters, &c.

The peculiar form of the timbers, spanning from truss to truss, and the offices they are called upon to perform, together with the fact that no less than 20 miles of them are required for the construction of the roofing, render them worthy of a detailed description. They are now known as the *Paxton gutters*. The form of their section is clearly shown in fig. 9.

Figs. 9, 10, 11, 12.



The Paxton gutters;

Their details of construction;

Their trussing;

They consist of pieces of timber 24 feet in length, five inches wide by six inches deep. On the upper surface, a semicircular groove (C, fig. 9), $1\frac{1}{8}$ inch radius, is cut, in order to receive the external water from the roofs. On each of the two vertical sides of the timbers an oblique groove (B B, fig. 9) is cut, in order to receive the condensed water, which, trickling down the inner surface of the glass, finds its way to these small channels, and is carried along them to their ends, where oblique cuts connect them with the box-gutters.

As the length of 24 feet would be too great for the gutter to carry itself without bending, or, as it is technically termed, "sagging," the alternative presented itself of either very much increasing the scantling, or contriving some system of trussing. The former was rejected on account of its heaviness and unsightly appearance; it was therefore determined that a rod of iron (shown at A A A A, figs. 9, 10, and 11) should be passed beneath the Paxton gutter, should be secured to its two ends by cast-iron shoes (B, fig. 10), and should press up, at eight feet intervals in its length, two cast-iron standards (C, fig. 11), so as to effect a camber or rise in its whole length of $2\frac{1}{2}$ inches. So trussed, the gutter is capable of supporting no less a weight than $1\frac{1}{2}$ tons. A semicircular cut is given through the depth of the gutter at both ends, so that when two are placed end to end, the water may flow down to the box-gutters through a circular cavity. Twenty-seven notches are marked by a template, and cut on each side of the upper edge; a few of these are shown at D D D, figs. 10 and 11. The Paxton

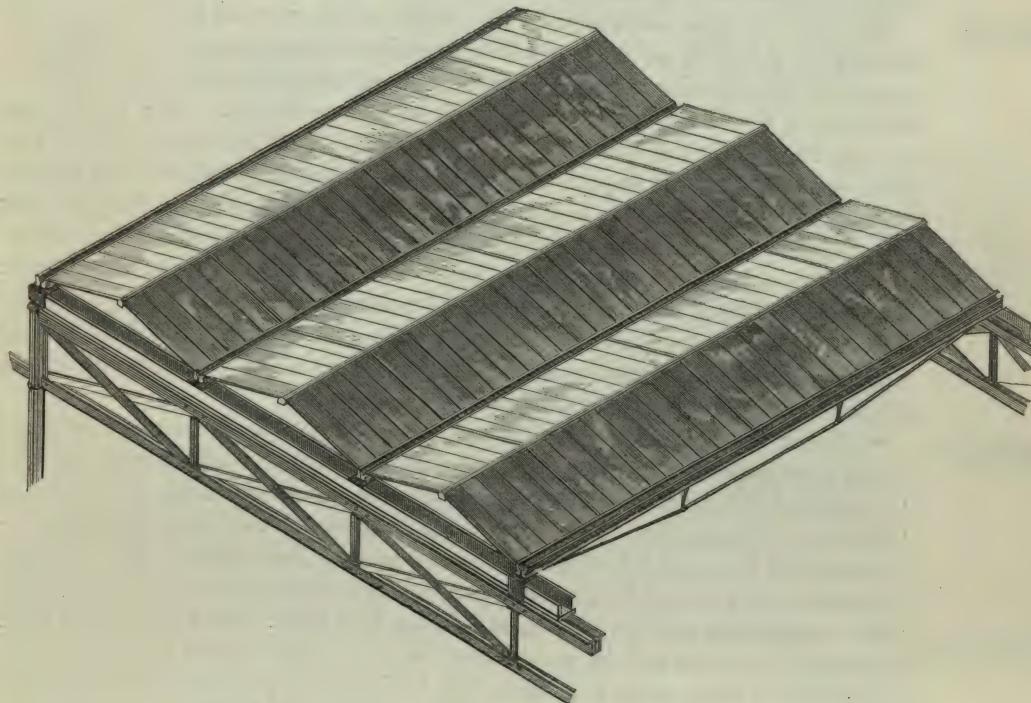
gutter, thus complete, is attached to a flanged iron plate, bolted on to the edges of the box-gutters, so that the parallel lines of gutter may form a continuous tie from the eastern or western ends of the Building to the transept, and so that, should the wood shrink in length, it may not pull apart and distort the sides of the box-gutters.

Three of the notches referred to as being cut on each side of the gutters, are larger than the others, and on them bars of wood, 2 inches by $1\frac{1}{2}$ inch, grooved for glass on both sides, are notched down. These bars (shown at A, fig. 12) form principal rafters, and, being set at a pitch of $2\frac{1}{2}$ to 1, are fixed to a ridge 3 inches by 3 inches, grooved for glass on both sides. The angle at which these are fixed being the one which Mr. PAXTON, in numerous experiments, has found to be best adapted to the construction of similar roofs.

One of the principal reasons which led to the adoption of eight feet and not more, as the pitch of these gutters from centre to centre, was, that the distance from ridge to gutter-edge might be covered with the largest sized glass that could be conveniently manufactured in one length, and that by that means the unsightly appearance, and frequently leaky condition, of joined glass, might be avoided.

The method of construction of a 24-feet bay of this system of roofing is shown in fig. 13, and from it the reader may be enabled to follow the description we are about to give of the construction of a length of roofing.

Fig. 13.



The gutters, principal rafters or main sash-bars, and ridge being fixed in place, the long edge of a sheet of glass, 4 feet 1 inch, by 10 inches, is inserted into the groove of the principal rafter, and a sash-bar (shown in section at B, fig. 12), 1 inch by $1\frac{1}{2}$ inch, also double grooved, is then put on to the other

Their connection with the roofing;

Reasons for fixing their pitch at 8 feet

A 24-feet bay of roofing;

feet

feet

feet

long edge of the glass. The sash bar is then brought down and secured at the top to the ridge, and at the bottom to the edge of the gutter; the lower edge of the glass bedding on putty about three-quarters of an inch wide. A slight blow to the lower end brings the upper edge of the glass home into the groove in the ridge. The glass being then pressed down, the putty is made good in the grooves externally, and by the repetition of this simple operation, the essentials of this system of roofing are constructed.

Lightness one of
the advantages of
Mr. Paxton's
roofing.

One among the many advantages of Mr. PAXTON's roofing is its extreme lightness. In the instance of that of the Exhibition Building, the whole of the roofing (the weight of the trusses that support it being of course deducted), weighs only $3\frac{1}{4}$ lbs. per foot superficial upon the average.

The canvas cover-
ing, how attached.

Its uses.

The flooring,

as described by
Mr. Paxton.

In order to mitigate the intensity of the light, and at the same time to assist in keeping the building cool, a canvas covering has been provided, extending over the entire area of the flat roof. The canvas is attached to the ridges, and allowed to hang down between them in a festoon. As one width of canvas is insufficient to reach from ridge to ridge, two are sewn together, the seam occurring in the centre, immediately over the Paxton gutter. The rain descending falls on the canvas, and clings to it by capillary attraction, creeping down until it arrives at the seam, where it passes through the canvas, and falls into the Paxton gutter; thus the danger of the passage of water which might take place through broken panes or imperfect putty-joints, is obviated, and the chances of leakage are consequently materially diminished.

In order to trace continuously the course of the vertical supports from the ground to the roof, we have not interrupted our description by detailing the nature of the flooring; but as that is one of Mr. PAXTON's ingenious contrivances, it would not be right to allow it to pass unnoticed. In a paper, read by Mr. PAXTON at the Society of Arts, on the 13th of November, 1850, that gentleman narrated the experiments which led to the origination of the present design, and stated that he had tried many methods, in order to find out the most suitable floors for the pathways of horticultural structures. After enumerating the objections to the use of stone and close boarding, he mentioned, that "he had ultimately been led to the adoption of trelliced wooden pathways, "with spaces between each board, through which, on sweeping, the dust at once "disappears, and falls into the vacuity below." He thus describes his application of these experiments to the Exhibition Building:—

"Whilst the accomplishment of this point" (the speedy removal of dust) "was most important in plant-houses, I consider it doubly so with respect to the Industrial Building, where there will be such an accumulation of articles of delicate workmanship. Before sweeping the floors of the Great Building, the whole will be sprinkled with water from a movable hand-engine, which will be immediately followed by a sweeping-machine, consisting of many brooms, fixed to an apparatus on light wheels, and drawn by a shaft. By this means a large portion of ground will be passed over in a very short space of time." The boards for the floor are $1\frac{1}{2}$ inch thick, laid half an inch apart, upon joists 7 inches by $2\frac{1}{2}$ inches, which rest upon large timbers or sleepers, 13 inches by $3\frac{1}{2}$ inches, at intervals of 8 feet apart. Through the interstices left between the boards the dust passes, and the merits of this system of flooring are thus summed up by Mr. PAXTON:—"It is very economical, dry, clean, pleasant to walk upon, admits of the dust falling through the spaces, and even when it requires to be

"thoroughly washed, the water at once disappears between the openings, and the boards become almost immediately fit for visitors."

Conclusion of notice of general construction of one 24-feet bay.

Having now endeavoured to furnish the reader with sufficient detail of a small portion of the building, to enable him to use it as a scale, whereby to estimate the quantity of labour represented by a structure of the general dimensions we are about to enumerate, it may be stated that the total area of the ground floor is 772,784 square feet, and that of the galleries 217,100 square feet. The galleries extend nearly a mile in length. The total cubic contents of the building are about 33,000,000 feet; there are nearly 2,300 cast-iron girders, and 358 wrought-iron trusses for supporting the galleries and roof, 30 miles of gutters for carrying water to the columns, 202 miles of sash bars, and 900,000 superficial feet of glass. The width of the nave is, within 10 feet, double that of St. Paul's Cathedral, whilst its length is more than four times as great.

General dimensions and quantities.

With a general knowledge of the construction of the nave, we may imagine the visitor, returning to the transept, better qualified to enter into the mechanical details, and the amount of difficulties presented to his notice, by that great feature of the building. The arrangement of the vertical shafts, galleries, &c., is similar to that of the nave; the main points of difference commencing at the level of the flat roof. It will be remembered that the spaces to be covered at a height of its roof. 64 feet from the ground, are, firstly, a main avenue, 408 feet long by 72 feet wide; and secondly, two aisles, each 408 feet long by 24 feet wide. It was determined that a semi-cylindrical vault should span the larger of these areas, and for that purpose semicircular ribs (see Plate I.) extend from side to side, their ends being inserted into the hollow columns, whilst they are steadied by the insertion between, and at right angles to them, of stout timbers, 9 feet 2 inches from one another, acting as purlins.

The structure of the ribs is shown in fig. 14. To quote from a paper descriptive of the building, read at the Institution of Civil Engineers, on the 14th of January, 1851, "they are made in three thicknesses of timber, cut into segments, 9 feet 6 inches long, of a circle of 74 feet extreme diameter, the centre thickness being 4 inches by 13 $\frac{1}{2}$ inches, and the outer, or flitches, breaking joint with the centre, being 2 inches by 13 $\frac{1}{2}$ inches. The flitches are nailed to the centre thickness, and $\frac{5}{8}$ ths inch bolts, about 4 feet apart, on the segment, traverse and bind together the three thicknesses. On the extrados, or outer circumference of the wooden arch thus formed, two planks serving as a gutter board 11 inches by 1 inch, and a bar of iron 2 inches by $\frac{5}{8}$ ths inch, are bent to the curve; and on the intrados, or inner circumference, a piece of timber, 7 inches by 2 inches, moulded to correspond with the form of the columns, and a bar of iron, 3 $\frac{1}{2}$ inches by $\frac{5}{8}$ ths inch, are also bent to the curve. Bolts, at intervals of 2 feet from centre to centre, passed through the depth of the rib, unite these additions to each other, and to the main rib, which, thus increased in scantling, measures, complete, 1 foot 6 inches by 8 inches." In order to perfectly connect these ribs, so that any force exerted, by wind or other causes, tending to the displacement of any one of them, may be distributed over the whole mass, iron rods have been set diagonally, forming a complete reticulation over the whole inner surface of the roof. The main ribs are fixed spanning the transept, at intervals of 24 feet from centre to centre. Each of these 24 feet widths is divided into three parts, and at 8 feet from one another, and from the main ribs, minor ribs are introduced. Between them again, but being semicircles of larger

Construction of the ribs of the transept roof.

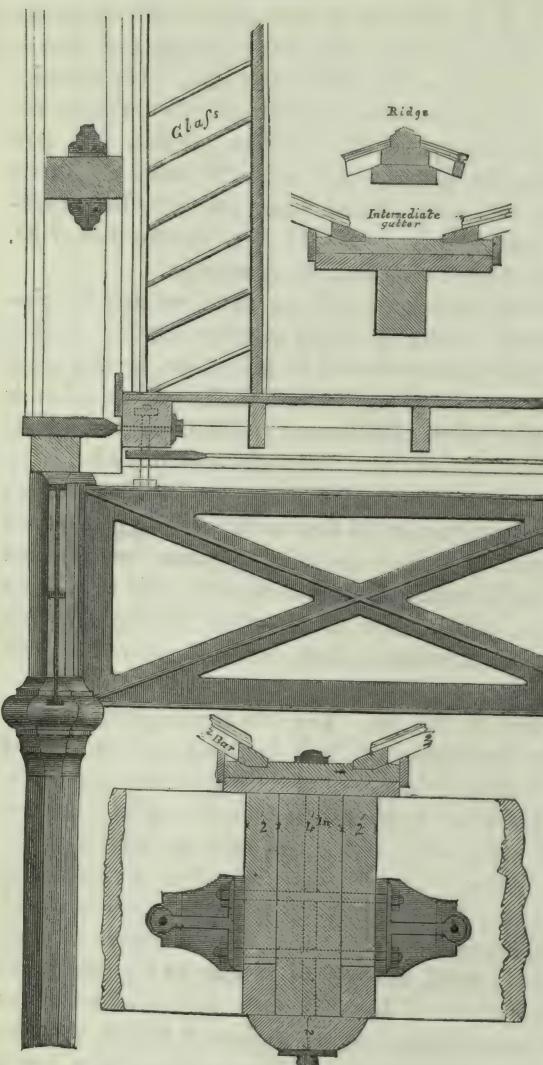
Description quoted from "Transactions of Institution of Civil Engineers."

The transept roof, how constructed.

diameter, are fixed small ribs of wood, which being connected with the main and minor ribs by means of sash bars, become available as ridges. The space between

Fig. 14.

Transept Ribs.



Section of Transept Rib, and springing of ditto.

strain, horizontal trusses of wrought-iron were constructed beneath the lead flats, consisting of bars capable of being keyed up at any time from the lead flats, and thus any tendency to movement, on the part of any of the ribs, would be immediately transferred either to the extreme north and south ends, where their feet are securely tied together by the cast-iron girders which cross the transept at those points; or to the angles where the transept intersects the nave, and where the whole force of the *vis inertiae* of the nave roof would serve as abutment.

The general effect produced by this semi-cylindrical roof covering the large elms beneath, is shown in Plate I.

The external enclosures or walls, as seen from within, on the two upper

them and the ribs is glazed and finished on the same system as that adopted in the flat roof of the building, the sash bars being set at an oblique angle, or "herring-bone" fashion, in order to assist the conduction of the water, and prevent its lodging against the lower putty bed of each pane of glass over which it trickles.

Along the summit of this semi-cylindrical vault runs, from north to south, a narrow lead path, in order to afford access to the apex of the roof, and to provide a means of lowering down workmen to repair any damage that may possibly happen to it. As the quantity of water discharged from this vault must necessarily be considerable, it was deemed advisable that the 24-feet aisles on each side of it should be covered with lead flats, instead of the ordinary glass roofing. These lead flats presented also the further advantage of being so completely connected, as to form solid abutments, steadyng the feet of the ribs. In order to convey any pressure in the way of thrust, that the ribs might exert, to those points best capable of resisting

stories, consist of glass in wooden sash frames, inserted between columns 8 feet from centre to centre, and louvre frames for ventilation, surmounting the sash frames. On the ground story, boarding takes the place of the glass; and the height being 24 feet instead of 20 feet, an additional tier of ventilators is inserted. The columns at 24 feet apart being of iron, the intermediate ones, dividing that width into 8 feet compartments, are of wood.

As no less than 1,500 sash frames have been used, they may justify a few words of description. To quote again from the Transactions of the Institution of Civil Engineers, we learn that "the sash frames are $2\frac{1}{2}$ inches thick, with seven bars in their width; the bars being $2\frac{1}{2}$ inches deep, double grooved for glass. Wrought-iron bolts, $\frac{3}{8}$ inch diameter, pass completely through the sash bars and sash frames, at the points where they are attached to the columns; and thus a chain tie is kept up all round the building, in order to prevent displacement of the sashes either bodily or in portions, by the pressure of the wind. To further guard against the same action, timber bridges, $3\frac{1}{2}$ inches by $1\frac{1}{2}$ inch in the centre, are fixed across the middle of the length of the sash; and at the internal angles, where the wind will exert its greatest force, iron rods, half an inch in diameter, are fastened from column to column, pressing against the wooden bridge, and converting it into a continuous strut, bearing up against any force applied to the exterior of the sash. In order to glaze the sashes, the glass is slipped down between the bars, and provision is made for mending, by causing one groove to be cut deeper than the other, so that the glass may be slipped in from one side, and puttied into its exact place. A similar provision is made for mending the roof glass."

As whatever lateral force the wind may exert upon the building will be principally received by these sashes, it may not be inappropriate, in considering them, to advert briefly to the general question of the action of wind upon the building.

The action of
wind on them,
and on the build-
ing.

On the 15th of January, 1851, a meeting was held at the Society of Arts, at which Mr. Fox, one of the contractors for the building attended, to afford the members of that Society an opportunity of asking any questions as to the general points of stability and durability, on which they might desire information. One of the questions proposed was, "What would be the effects of the wind on such an extensive surface as the building presented, and what means were taken to counteract them?" and as Mr. Fox's reply embraced with remarkable clearness the principal facts connected with the argument, we shall give it at length. Mr. Fox replied "that the building rested on 1,060 columns on the ground floor, and the most likely direction for the wind to have any injurious effect on the building, must of course be in the direction of its greatest width, which was 1,800 feet as compared with 400 in the opposite direction. These columns rested on cast-iron plates based upon concrete; and there was no possibility of their rocking about without the base-plates being broken. Above these plates were sleepers, that carry the floor. They were 13 inches in depth, and fitted accurately up against the two sides of the column, and running transversely from one side of the building to the other; so that it would be very difficult to conceive that one of these columns could be possibly upset until it was actually broken in two. And again, at the top the columns are united together by cast-iron girders 3 feet deep, and four columns are framed together, very much as they would frame a table. Now to break the column,

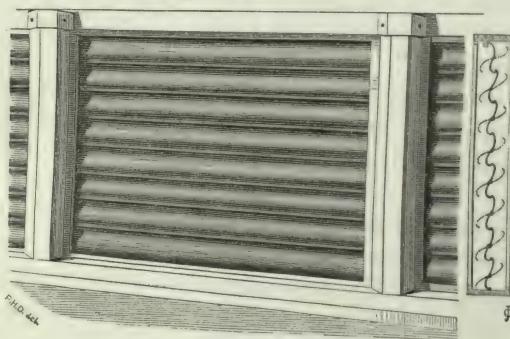
How described by
Mr. Fox.

“ they must exert a force equal to that of twice the transverse strength of the column. According to the experiments it was found that six tons was the bearing weight, and 12 tons the breaking weight of the columns in the centre. Now, 1,060 columns multiplied by six tons, the bearing weight, was equal to 6,360 tons; so that it would be necessary to exert a force equal to 6,360 tons, “ at a height of 24 feet from the ground, before they would be able to blow down “ the building, and he was now treating of the building independently of its “ bracings. The greatest force of wind ever known had been computed at 22 lbs. “ to the superficial foot. Taking 28 lbs. as the force, and assuming that they “ could have a gust of wind which would strike the whole side of the building “ from top to bottom at the same moment, the total force which could be brought “ against it would be from 1,400 to 1,500 tons. Now, they had got power to “ resist it of 6,360 tons, not taking into account the bracings and the other con- “ structions and offices which were within the building, and which must of “ course add to its strength. The building had been tested in the late gale, when “ Colonel REID ascertained that the force of the wind was 19½ lbs., and it did “ no harm whatever; and that was at a time when the roof was not on, and the “ building was quite exposed.”

The ventilators.

The ventilators, to which allusion has been made, and which are shown in fig. 15, fulfil an important office in the building, acting as the organs of respiration

Fig. 15.



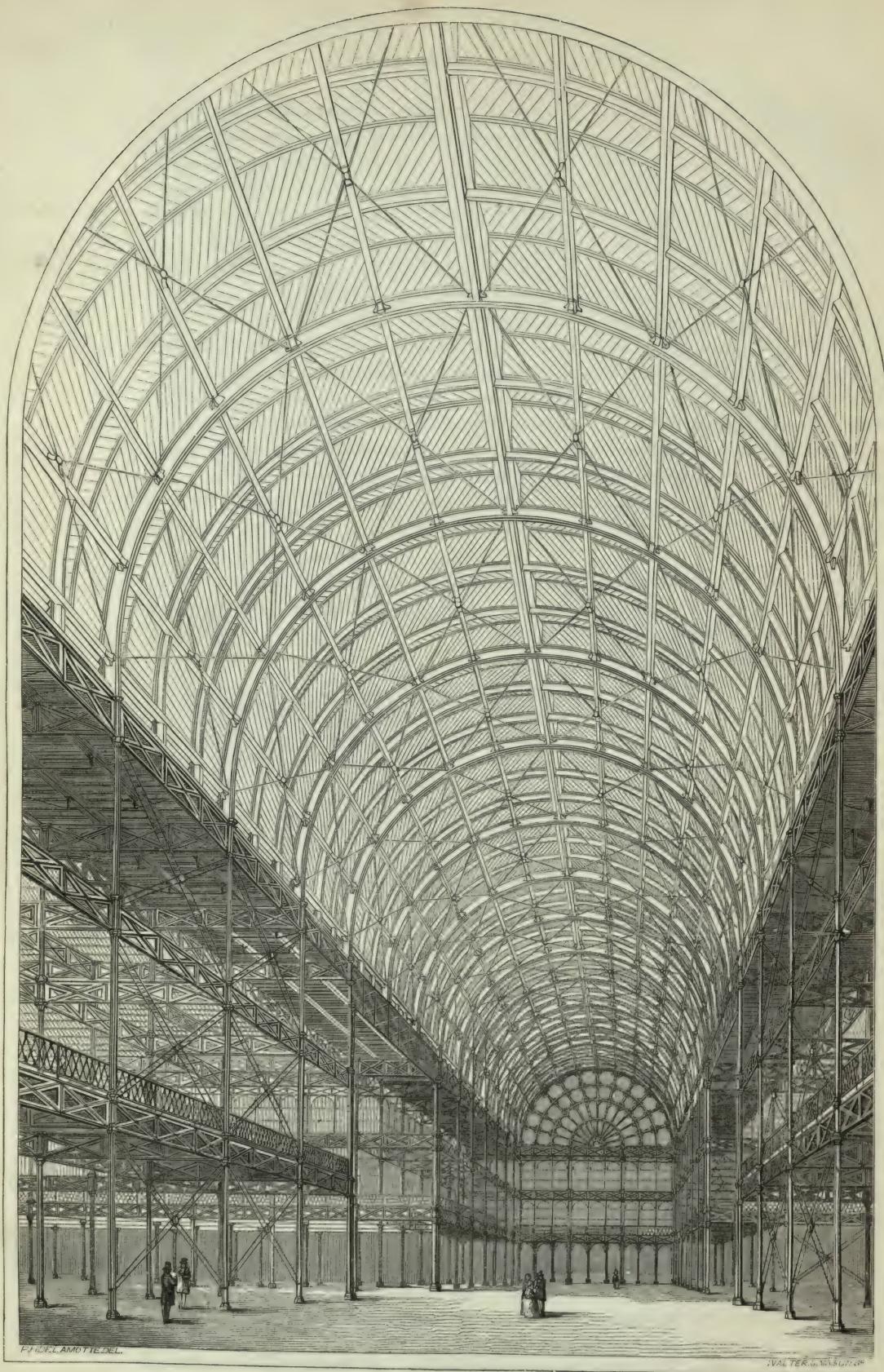
pivots at 6 inches from centre to centre. Of these there are eight in the wooden frame inserted between the columns and the sill on the ground floor, and six in those which surmount the sash-frames on the two upper stories. The section of the blade is of a novel form, and is calculated, when open, to afford the minimum interruption to the passage of the air, compatible with being weather-tight at all times. To each blade, in the centre of its length, are attached small iron brackets furnished with eyes, through which pins are inserted; which pins are secured in a species of wooden rack. These racks are connected with cranks attached to iron rods, to which a movement of torsion is conveyed by screws and powerful levers. A moderate exertion of the strength of one man applied to one of these levers, suffices to regulate, with facility, no less than 600 feet superficial of ventilation.

The decoration.

Hitherto the building has been considered only in a structural point of view. The vivacity of any impression it may convey to the casual visitor will, however, probably depend more strongly on the system of decoration which it has received from Mr. OWEN JONES than on any of the constructional details we have been describing. That gentleman, whose studies in Egypt and in the East generally,

to the whole body. The total surface of ventilation is nearly 50,000 superficial feet, and the whole has been so arranged, that, by the application of one man's strength, at about 90 different points, the whole may be opened, closed, or set and secured at any desired angle, simultaneously. The ventilators themselves consist of galvanized iron blades of an S form, 6½ inches wide, fixed on





25.

VIEW OF THE INTERIOR OF THE BUILDING FROM THE SOUTH ENTRANCE.

[Plate I., p. 57.]

in Spain, and in other countries of Europe, had qualified him for the task, was enabled at an early stage in the progress of the building, to foresee the effect of the combination in perspective of its various lines. Serious apprehensions were at first entertained as to the propriety of the application of colour, usually devoted to the decoration of extended surfaces, to what were asserted to be lines only. Mr. JONES was, however, enabled to estimate how far the merging in distance of those lines would give them the appearance of surfaces, and the three tints of blue, red, and yellow have been distributed by him over the columns and girders, so that as the surfaces blended in perspective, each column has allied itself in colour with its fellow column, each vertical face of girder with the vertical faces of its fellow girders, and each soffite, or underside, with its fellow soffites. Breadth and distinctness were given to the enunciation of each colour. The light of the sky appearing through the interstices of the roof, the principal portions of which have been tinted of a delicate blue, unites with the colour, giving it at once air and brilliancy. The effect of this mode of treatment has been to add considerably to the apparent elevation of the building. By varying the colours of the vertical and of the horizontal lines, and retaining each uniformly, the eye is enabled to detect, at even the greatest distance, the direction and position of every part of the construction, and thus the otherwise endless confusion of the complexity of lines, is reduced to order and simplicity.

Although a provision for the gratification of the intellectual tastes of the visitor has been the main object in the formation of the Exhibition Building, ministering to his more ordinary appetites has not been lost sight of. The refreshment rooms, &c. Commodious refreshment rooms, with the accompaniments usually connected with them at large railway stations, have been provided around the trees at the northern extremity of the transept, and adjoining open courts towards the eastern and western extremities of the buildings, where the presence of the trees dictated their location.

The official business connected with the conduct of the Exhibition rendered The offices. necessary the employment of a large staff of clerks, &c., for whom, and for the juries, &c., a considerable extent of accommodation has been provided in offices placed on each side of the southern entrance.

We have supposed our visitor to enter on the south side; admittance may, The entrances and exits. however, be also gained at the eastern and western ends, where similar vestibules, 72 feet by 48 feet, afford accommodation for turnstiles, check-takers, &c. Disposed at nearly equal distances from one another, on the four sides of the structure, are 15 exits, by passing through either of which the building may be quitted.

In issuing from its precincts the visitor will pass through the gates of an iron railing designed by Mr. OWEN JONES. Retreating to some distance, he will be enabled to take in a general impression of the whole building, as shown in fig. 16. From the north-west angle the most picturesque view is to be obtained, and from that position may be best appreciated the grand effect produced by Mr. PAXTON's happy idea of raising the semi-cylindrical vault of the transept roof, above the tiers of terraces which extend on either side of it. For much of the grace of proportion and beauty of form, which from this point of view the visitor cannot fail to notice, the building is indebted to Mr. BARRY. Upon the form and distribution of the arches and filling-in frames, as well as of the columns, the suggestions of that gentleman exercised a happy influence.

The details of an 8-feet bay of elevation.

In fig. 17 we have given a view of a bay of the building, 8 feet in width; and from that and the other illustrations a tolerably correct idea may be formed of the nature of its external construction.

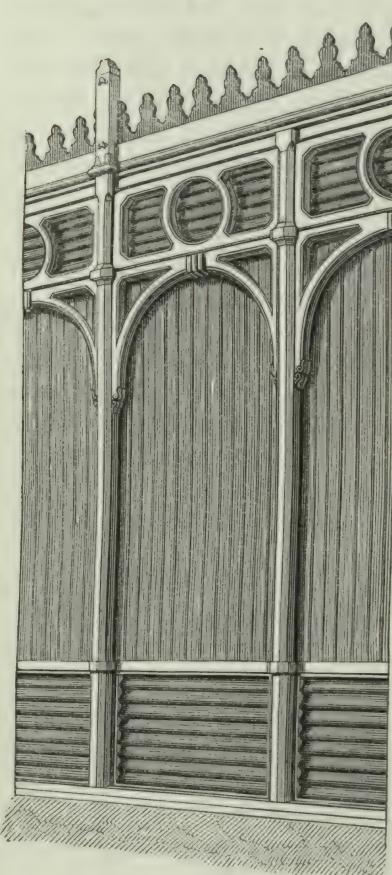
The spaces enclosed at eastern and western ends.

At the east and west ends considerable spaces have been enclosed, for the purpose of affording accommodation for large objects, the weight or dimensions of which precluded their admittance into the building.

The boiler-house.

At about 155 feet from the north-west angle, a structure, 96 feet by 24 feet, has been erected for the purpose of containing the boilers for generating steam, to be supplied to give motion to the various machines requiring to be exhibited

Fig. 17.



in operation. The external appearance of this building precisely corresponds with that of a portion of the main edifice of similar dimensions. It contains five boilers, equal to 150-horse power, and a large tank, serving as a balance-head to the water-supply. This supply consists of a 6-inch main, entirely surrounding the building; upon it, at intervals of about 240 feet, are placed fire-cocks; and at different points in its circuit 16 4-inch branch-pipes enter the building, and lead so far into the interior, that fire-cocks placed upon their ends are so situated that circles of 120 feet radius drawn from each of them would intersect one another. The mains running on the north and south sides of the building are connected across the transept by a 5-inch main, from which, near the centre of the building, pipes diverge, leading east and west, for the supply of the various fountains placed upon the central line of the nave.

Having endeavoured to convey some general idea of the nature of the building as it at present stands, it may be desirable to trace the successive steps by which it has grown into the form it now assumes.

When it is remembered that the tender for its construction was not accepted by the Royal Commissioners until the 26th of July, 1850, that possession of the site was only obtained on the 30th of the same month, and that the first column was fixed on the 26th of September, it will be manifest that into the intervening period must have been crowded arrangements, which, under ordinary circumstances, would have required at least double that period for their completion. Details of construction had to be settled, elaborate calculations as to the strength and proportions of the several constituent parts to be made, machines for economising labour to be devised, contracts for the supply of materials to be entered into, and thousands of hands set actually to work. How unintermitting since that period the labour must have been is testified by the fact, that the opening of the Exhibition takes place on the 1st of May, the day originally appointed.

On the ground being given up to the contractors, the first work undertaken was the construction of a hoarding to inclose the whole area of the site. This hoarding was formed by the insertion into the ground, in pairs, of the timbers ultimately to be used as joists. Between each pair of uprights were slipped the ends of boards, ultimately to be used as floor-boards; and these were secured by attaching together the two ends of the joists extending above them. Thus the expense of the hire of waste boarding was avoided; the timber composing the hoarding was completely uninjured; and the celerity with which the whole area was surrounded was truly remarkable.

Hoarding commenced on site being given up to contractors.

The task of setting out the plan of the building was intrusted to Mr. BROUNGER; The setting out. and the extreme accuracy with which the situation of every column was fixed, and the adjustment of every level was performed, reflects credit upon that gentleman.

In order that the measurement of 24 feet, upon which the accuracy of How proceeded with. the whole plan depended, might be indicated with extreme precision, poles of thoroughly-seasoned pine were fitted with gun-metal cheeks, or small projecting plates, the ends of the poles extending a few inches beyond the cheeks. The measurements were taken by laying one pole on the other, so that the inner edges of the gun-metal cheeks, set at precisely 24 feet from one another, might be brought into contact. Thus the danger of any error, arising from the ends of the poles becoming damaged in use, was avoided. Stakes having been driven into the ground to indicate approximately the position of the columns, their precise centres were ascertained by the use of the theodolite, and marked by driving a nail into each stake at the exact point. When it became necessary to remove these stakes, in order to dig out holes for the concrete foundations, an ingenious method was resorted to, for at any time identifying the position occupied by the nail which had been removed. To effect this a right-angled triangle was framed in deal, at the two ends of which saw-cuts were made. Previous to the removal of the stake, the apex of the triangle was set to the nail indicating the situation of the centre of the column. Two other stakes were then driven beneath the saw-cuts, and two nails driven in at the ends of the saw-cuts. The wooden triangle being then removed, the centre stake was withdrawn, the hole made, and the concrete thrown in. The height of the surface of the mortar, varying with almost every column, was regulated by pegs driven to the correct level under the direction of Mr. BROUNGER. Another triangle of a somewhat similar character to, and having saw-cuts in the same position as, the one already described, having two of its angles adjusted to the two stakes remaining in the ground, determined the exact position in which the base-plates had to be fixed.

As every casting was delivered on the ground, it received a careful examination, and an immediate coat of paint. The girders, upon the perfect soundness of which the stability of the galleries and roof mainly depended, were subjected to a rigorous test, in a machine arranged for the purpose by Mr. CHARLES HEARD WILD. One of Mr. HENDERSON's patent cranes was so placed, that, on a waggon containing girders being brought beneath its range, a girder was lifted from the waggon, and deposited upon a weighing apparatus. An account having been taken of its weight, the girder was again lifted by the crane, and carried forward to an extremely strong frame, the two ends of which corresponded in form and dimensions to the connecting pieces with their projections. The girder being securely confined in these clutches, a force was exerted upon it at the two points upon which the weight of the floors and roofing would have to be carried, that is

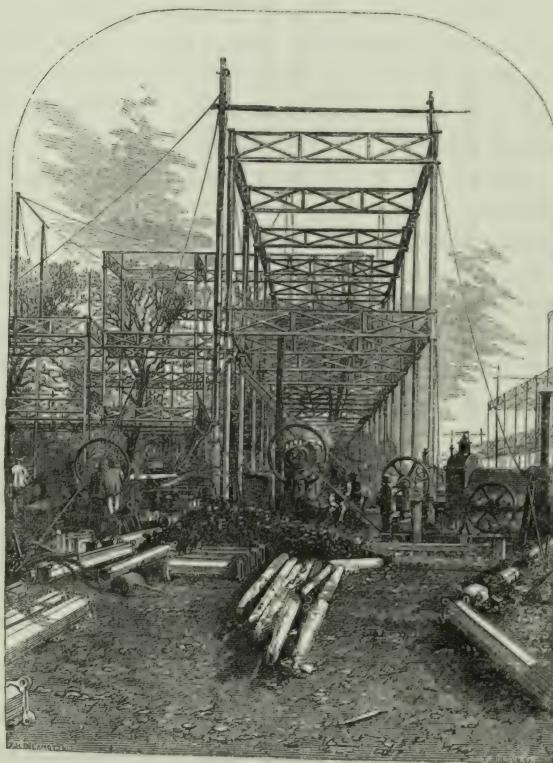
Castings examined and girders proved how.

to say, immediately over its vertical lines. The force thus communicated was applied by two pistons, forced upwards by a modification of BRAMAH's hydraulic press; the principle of which, it will be remembered, depends upon the power gained by forcing water (by means of a small piston) into a strong cylinder in which a larger piston works; the power being increased in the proportion borne by the area of the piston to be raised to the area of the small piston. A registering apparatus affixed to the pipe leading from the force-pump to the testing-machine, afforded the means of adjusting the pressure exercised by the hydraulic press. A careful observation of this apparatus conveyed the assurance, that every girder, according to its ultimate destination, was proved to a strain of either 9, 15, or 22 tons. After testing, the girder was released from its confinement, again raised by the crane, and stacked in a convenient place ready for removal. So admirably were the various arrangements made for conducting these operations, that it was possible for a girder to be lifted from its wagon, weighed, secured in the testing-machine, proved, released, again raised, and finally deposited, in less than four minutes.

The columns and
girders, how
raised,

In order to elevate the columns to their places, what is known in technical language as a pair of shear-legs was employed. This simple apparatus consists of two poles lashed together at their heads, and maintained in a steady position by ropes extending, from the apex of the triangle formed by the base-line of the ground, and the inclination of the poles, to one another, to stakes driven into the ground at a considerable distance. From the apex of the triangle a series of ropes passing over pulleys were suspended perpendicularly; and, by means of this "fall," the majority of the columns, girders, and other heavy portions of the construction, were elevated to their places. The operation of raising girders is shown in the

Fig. 18.



steadied,

view, fig. 18, but on so small a scale as to convey only an imperfect idea of its detail. Modifications of the simple apparatus described sufficed to hoist almost every part of the necessary iron-work. A connecting-piece was attached to each column previous to its elevation; and so soon as two columns with their connecting-pieces were fixed, a girder was run up, slipped between the projections of the connecting-pieces, and secured in its place. An opposite pair of columns having been similarly elevated, another girder was attached to them; and thus two sides of a square were formed, and maintained in a vertical posi-

tion by poles acting as supports to them. Two other girders being then hoisted, and slipped between the connecting-pieces on the remaining two sides of the square, a perfect table was constructed. The "shores" or supports were then removed, together with the shear-legs, and the whole apparatus was at liberty, for the purpose of recommencing a similar operation in an adjoining 24-feet bay.

When a sufficient number of these bays had been completed, starting from the intersection of the nave and transept, to warrant the addition, the hoisting of the columns for the first floor was commenced; more lofty shear-legs being of course employed. The extension of the ground-floor structure proceeding, as that of the first floor was carried on, a base was in turn afforded for the columns of the third tier; and thus the iron frame work of the whole building rose from the ground, firm and secure, without involving the necessity of any scaffolding whatever.

While these operations of actual structure were being carried on, under the immediate superintendence of Mr. JOHN COCHRANE, the work of preparation was yet more vigorously pushed. The manufacture of the Paxton gutters, and the application of machinery to their formation, is so interesting, as to warrant a somewhat lengthened notice.

In the year 1837, when Mr. PAXTON commenced the construction of the Chatsworth conservatory, in which similar gutters were employed, machinery had not been brought to bear upon their construction. By the use of a contrivance, the details of which were arranged by Mr. COWPER, a gentleman in the employment of Messrs. FOX and HENDERSON, a total length of upwards of 2,000 feet per day has been turned out, for many successive days. The pieces of timber destined to form the gutters are sawn into lengths of 24 feet, 6 inches deep, and 5 inches thick. Three of these pieces are fixed on the frame of a planing-machine, and by it are worked true and square. In figures 19, 20, 21, and 22 are given representations of the details of the gutter-making machine, erected at Messrs. FOX and HENDERSON's workshops, near the Thames, at Chelsea. Fig. 19 is a side view of a block of cast-iron, to which steel cutters (AAAA) are attached by bolts and nuts (BBBB). Four blocks, of similar construction, are fixed to four spindles, and by the action of drums on the same spindles, set in motion by bands moved by a steam-engine of 20-horse power, the blocks are made to revolve with extreme rapidity. Any piece of timber exposed to the action of these cutters, must obviously be scooped out into the form of the outline of the cutters attached to each block. By modifying the form of the cutters almost any variety of section can be given to the timbers brought into contact with them. In the present case, the four sections A, B, C, and D (fig. 21), represent the successive action of the four sets of cutters lettered to correspond with them (on fig. 20), by means of which the larger cavity for the rain water, and the two smaller channels for the condensed water, are formed. The part removed by each set of cutters is shown by the hatched lines.

Fig. 22 represents a plan of the machine, looking down from above upon the gutters, the gutter being removed in order to show the action of the cutters more clearly.

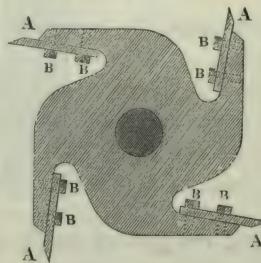
The operation may be explained as follows:—The piece of timber, properly squared, is placed upon the roller marked E, it is then pushed on until it comes

The second and
third stories com-
menced without
scaffolding—how.

The preparation
of the other wrol

The gutter-
making machine

Fig. 19.



Its mode of
operation

in contact with the roller marked F, the projecting points on which so far seize it as to propel it forward to meet the rapidly revolving set of cutters marked A. Passing onwards to B, it is subjected to a second action. By C a third operation is performed, and in passing through D, a perfect form is given to the piece of timber. Thus, while, the end beyond D presents the perfect section of a

Fig. 20.

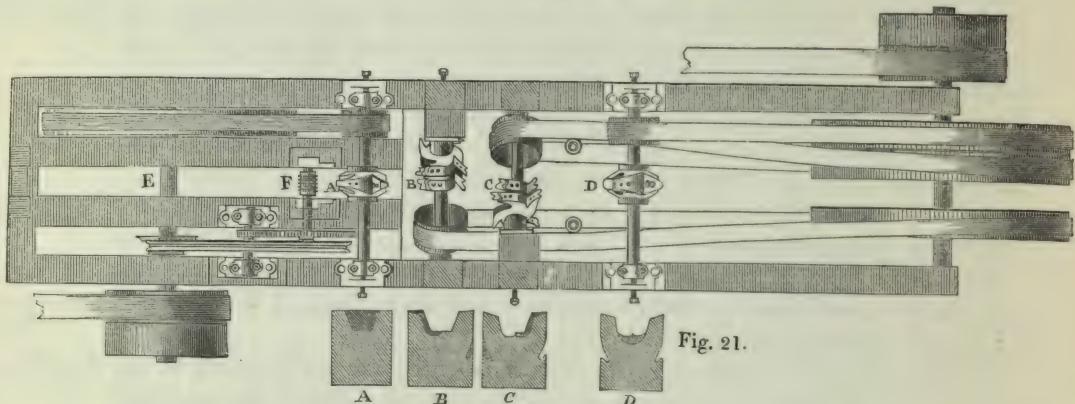
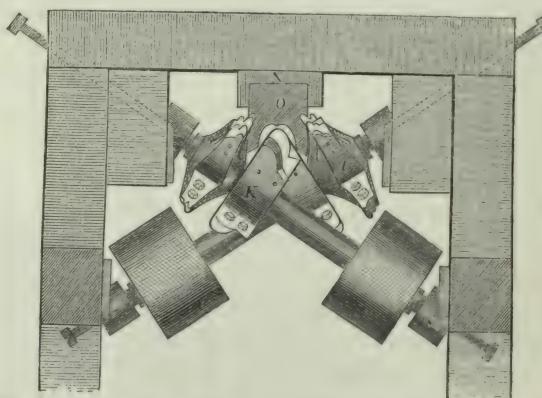


Fig. 21.

finished gutter, the other end, which has not yet passed the set of cutters at A, remains in its original square form. In fig. 22, a vertical section is given, exhib-

Fig. 22.



iting the precise angle at which the cast-iron blocks are made to revolve, and the cutters to clear away the timber before them. O shows the section of the gutter acted on by the cutters, N the holdfast by which the gutter is kept in its place during the operation. By the use of this machine three feet of gutter can be made per minute, and, working night and day at this rate, the whole quantity required was completed in two months.

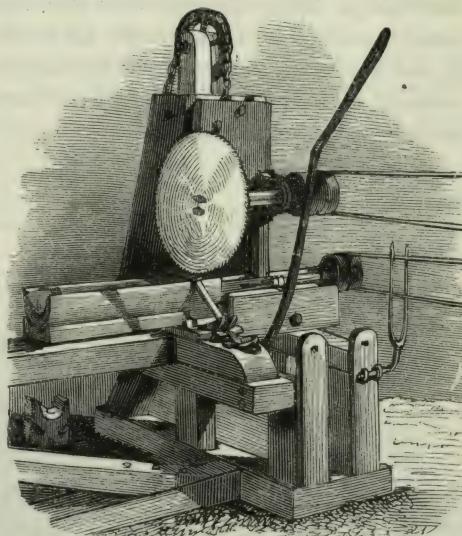
The Paxton gutters, thus prepared, were delivered on the ground, and after having been carefully examined, and the defective ones removed, they were conveyed to other machines (*vide* fig. 23), fixed upon the ground, by means of which they were finished ready for use. A large circular saw, the spindle of which could be raised or depressed by the action of a lever, had fixed in the centre of one of its sides two gouges, adapted to produce, by rapid revolution, a semicircular groove. A frame, the exact length of the gutters, was fixed at right angles to the

plane of this saw. In the centre of this frame a species of chair was constructed, capable of turning round, and a shoe was fixed at the extremity of the frame farthest from the saw. The end of a gutter about 24 feet long was thrust into this shoe, and its middle supported by the chair already mentioned. The end nearest to the saw was then pressed down, and secured by an iron strap. Thus retained in position, it was necessarily bent to precisely that camber arranged to be ultimately given to it by suspension-rods and struts. The circular saw, revolving rapidly, was then made to descend until its edge came in contact with the end of the gutter, which it cut to the precise length required, and at exactly the right angle. The axis of the circular saw was then still further lowered down, until the gouges fixed on its side cut their way through the gutter, making a semicircular groove through its depth. One end being thus scooped out, the gutter was released from its position, turned round, and secured in a contrary direction in the shoe at the opposite extremity of the supporting frame. The other end of the gutter, thus presented in its turn to the saw, was then subjected to a similar process, after which it was removed, perfectly ready for the attachment of its iron bowstring.

A machine of somewhat similar construction (though much simpler) to that by which the Paxton gutters were made, brought the ridges to their proper form.

In the course of numerous experiments which Mr. PAXTON had commenced as early as the year 1828, the great necessity for providing some machine by which a quantity of sash-bars might be speedily and economically cut, was forcibly impressed upon his mind. In the paper we have already quoted, Mr. PAXTON thus describes the origin of machines of this description:—“In 1837 the foundations of the great conservatory (at Chatsworth) were commenced; and in constructing so great a building, it was found desirable to contrive some means for abridging the great amount of manual labour that would be required in making the immense number of sash-bars requisite for the purpose. Accordingly, I visited all the great workshops of London, Manchester, and Birmingham, to see if any thing had been invented that would afford the facilities I required. The only apparatus met with was a grooving-machine, which I had at once connected with a steam-engine at Chatsworth, and which was subsequently so improved as to make the sash-bar complete. For this apparatus the Society of Arts, in April, 1841, awarded me a medal, and this machine is the type from which all the sash-bar machines found in use throughout the country to the present time are taken. As the conservatory was erected under my own immediate superintendence, I am able to speak accurately as to the advantages of the machine. It has, in regard to that building alone, saved in expenses 1,400*l.* The length of each of the bars of the conservatory is 48 inches, only one inch shorter than those

Fig. 23.



The ridges.

The sash-bars,
Mr. Paxton's
improvements in
the manufacture
of, generally.

“ of the Exhibition Building. The machine was first used in its present form in August, 1838, and its original cost, including table, wheels, and everything complete, was 20*l.* The motive power is from a steam-engine employed on the premises for other purposes, and any well-seasoned timber may be used. The attendants required are only a man and a boy, and the expense of the power required for it when in use is comparatively trifling. The sash-bars may be made of any form, by changing the character of the saws. There is one particular feature in working the machine, namely, that the bars are presented to the saws below the centre of motion, instead of above it, as is usual; and to the sides of the saw which are *ascending* from the table, instead of those which are *descending*. These arrangements were necessary to suit the arrangement of the teeth to the grain of the wood; for when the bars were presented to the saws in the usual way, the wood was crushed, instead of being cut and cleaned. It is essential that the machine should revolve 1,200 times in a minute to finish the work in a proper manner.”

Fig. 26.

Fig. 27.

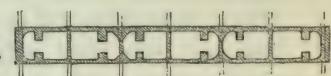
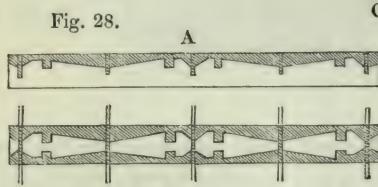
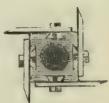


Fig. 25.



Sash-bar machine used for the building.

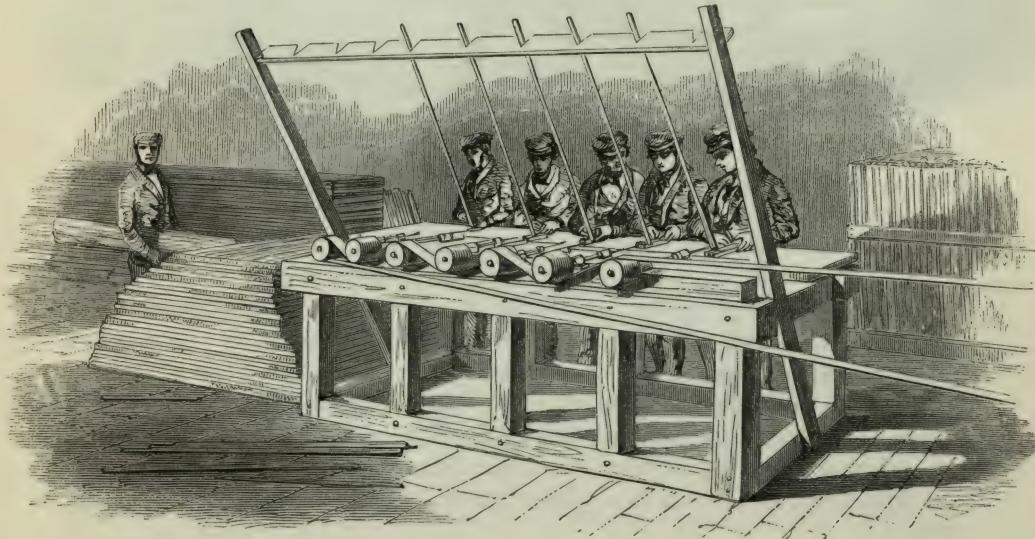
We shall now proceed to describe the modification of this machine, which is due to the inventive powers of Mr. BIRCH, of the Phoenix saw mills, near Cumberland-market, Regent's Park, with whom a contract was entered into by Messrs. FOX and HENDERSON for the supply of all the sash-bars for the roof, the upright bars for the vertical lights, and the ridges. Two of the principal points of difference between Mr. BIRCH's machine and that described by Mr. PAXTON are, that revolving cutters are substituted for saws, thus obviating difficulties incident to the grain of the wood; and that, by the addition of a second set of cutters, a plank passed between them is operated upon on its upper and under surfaces at the same time. In fig. 25 is shown a cast-iron block (somewhat similar to those previously described in connection with the gutter-cutting machine), to which are attached a variety of cutters. The rapid revolutions of the spindle (A fig. 26) operate upon the planks submitted to the action of the cutters, in the manner shown in fig. 28. So soon as the plank, presented by the feed-roller, has been operated upon by the rapid revolution of these miniature adzes, it is carried on by the roller C, and is subjected to the action of circular saws of varying diameters, the lesser of which cut just sufficiently deep to form the groove for the

glass, while the larger pass completely through the plank, and divide it into four finished sash-bars. In figs. 24 and 28 is represented the mode in which the sash-bars for the vertical lights are made, the hatched lines indicating the parts removed; and in fig. 27, the way is shown in which the sash-bars for the roof have been cut. Modifications in the cutters affixed to the spindle A, fig. 26, produce the variation in form.

As delivered at the building, the sash-bars were cut approximately only to their length, and in order that it might not be necessary to execute any carpentering operation on the roof, it was requisite that they should be adjusted on the ground, ready for fixing. An arrangement of circular saws, set at the angles requisite to cut the ends of the sash-bars to accord with the pitch at which they would have to be presented for attachment to the ridges, served at once to cut a large number passed between them to a perfectly uniform length, and to form the necessary rebate for notching down upon the gutter edges.

To ensure the gimlet-holes necessary for nailing down the sash-bars being made with perfect regularity, a row of five gouges were set in motion by a band from an adjacent steam-engine, passing over a series of drums. The sash-bars, placed at a proper angle to them, were moved along by boys, in the manner shown in fig. 29, and presented to the points of the gouges, by the rapid revolution of which the necessary nail-holes were pierced.

Fig. 29.



It yet remained to paint these sash-bars, and even for that purpose the ingenuity of Messrs. FOX and HENDERSON provided mechanical assistance. A number of brushes were arranged in a frame, at right angles to one another, in such a manner that their bristles would just admit of the passage between them of a sash-bar. In a trough filled with colour a number of sash-bars were immersed, and one of them being lifted from it, loaded with colour, and presented to an aperture at one end of the series of brushes, it was passed through them to a corresponding aperture at the other end; by which process the whole of the superfluous paint was removed, and the sash-bar drawn out as neatly painted as it could have been by the workman's hand. This machine is represented in use in fig. 30.

The machine
for painting the
sash-bars.

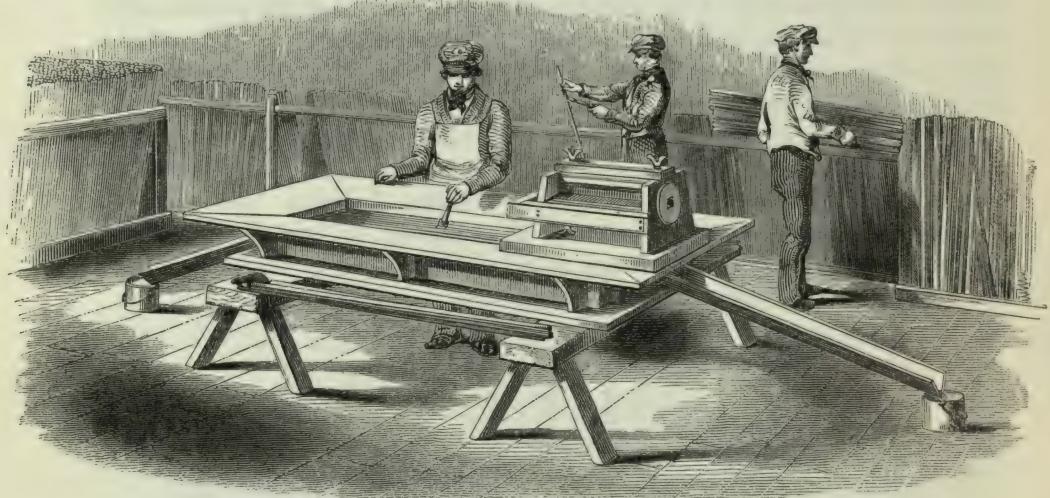
Morticing machine employed.

The making of the glass.

To facilitate the putting together of the sash-frames and sash-bars, considerable use was made of a machine for making mortices and tenons, patented by Messrs. FURNESS & Co., of Liverpool.

While these various machines were busily operating in the preparation of the necessary framework to receive the glass, Messrs. CHANCE BROTHERS & Co., of Smethwick, near Birmingham, to whom the contract for its supply had been committed, were not less actively employed. The large size of the sheets required (4 feet 1 inch by 10 inches), and the extraordinarily short time within which the

Fig. 30.



immense quantity necessary had to be supplied, demanded the employment of numerous additional hands, and workmen had to be sought for from abroad to assist in the completion of the order within the requisite time. The mode of manufacturing the description of glass employed is a great improvement on the old system of crown-glass making; as by it the variation of the substance occasioned by the thickness of the glass, as it approaches the bull's-eye, is completely avoided. In the manufacture of sheet glass, the workman, having taken up a lump of glass on the end of his pipe, alternately blows, swings his ball of glass to and fro, and rolls it upon a metal table until it assumes the form of a long cylinder; the ends being then taken off, and the cylinder cut in the direction of its length, the sheet of glass falls down, is flattened to a perfectly true face, and is then trimmed off and finished.

Progress made in framing roof trusses;

by means of drilling, punching, and cutting, machines;

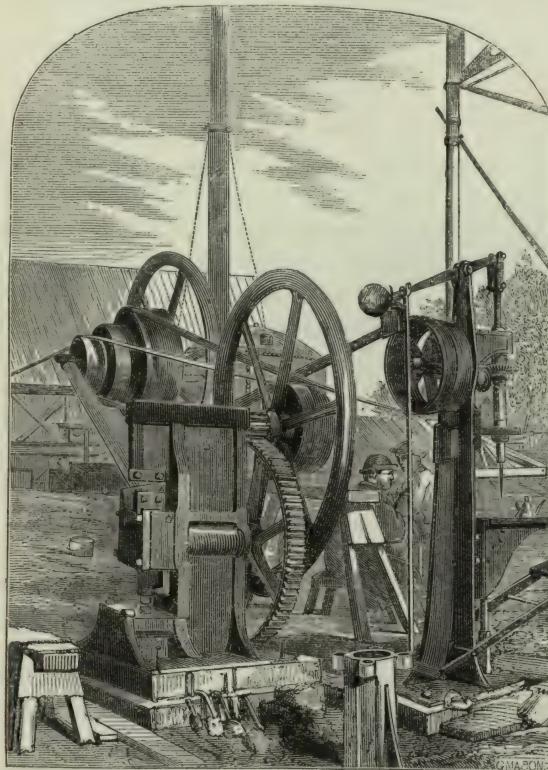
During the preparation of the materials necessary to commence the construction of the Paxton roofing, active progress had been made in the framing of the wrought-iron trusses requisite to span the central 72-feet nave, and the 48-feet avenues on each side of it. A steam-engine of 6-horse power gave motion to drilling, punching, and cutting machines, represented in figs. 31 and 32. By means of these, the necessary pieces of bar-iron were adjusted to their requisite lengths. The holes for rivetting having been marked upon them with templates, were punched out, and any larger perforations necessary for extra-sized rivets, drilled. The various parts, thus prepared for combination, were then arranged upon platforms, and the holes in the various portions being made to correspond,

the operation of rivetting was gone through. A row of temporary forges was ^{By rivetting up.} constructed by the side of the platforms, and the red-hot rivets taken from them were passed through the holes, and hammered by the workmen into their requisite forms.

While these active preparations for the construction of the roofing were in progress, the daily supplies of castings of every description were of the most abundant nature; no less than 316 girders having been cast and supplied in one week. As fast as the columns came upon the ground, they were taken to their places and immediately fixed. Up to the 20th of September 77 columns had been supplied.

The rate of delivery of columns, &c.

Figs. 31 and 32.



By the week ending the 25th of October, the average number fixed per week amounted to nearly 200, and that rate of supply was continued for several subsequent weeks.

The attention of the contractors was next directed to the formation of the transept ribs. The choicest timber was selected for that purpose, and under the careful superintendance of Mr. FOWLER, their form was set out upon a platform erected for the purpose, and the timbers for the first rib laid down. When the rib thus commenced was completed, it was made to serve as a template for the construction of a second; and thus one was fitted upon the others, until the pile had accumulated to four. Three of these having been then laid down in other places, the remainder were constructed upon them in a similar manner.

The formation of the transept ribs.

As the preparations for putting together the main structure advanced, it was ^{The progress of carpenters and joiners' work generally.} requisite to form the necessary wooden columns, sashes, matched and beaded

boarding, louvre frames, &c., for the external enclosures. The vertical sashbars, cut at the Phoenix saw-mills, were delivered by Mr. BIRCH in large quantities. Sash-frames, also cut at the same mills, were supplied, and these were fitted together by the contractor's carpenters, whose time and labour in forming mortices and tenons was much economised by the employment of the machine before alluded to, patented by Messrs. FURNESS & Co.

The increasing intensity of the work evidenced by—

As supplies of the smaller castings necessary to complete the various portions of the structure poured in, the work of erection and putting together proceeded with wonderful rapidity. The progressive increase in the number of hands employed affords a tolerable indication of the increasing intensity of the work:—

The number of hands employed.

1850.	In the week ending Sept. 6,	39 men were employed.
	Oct. 4,	419
	Nov. 1,	1,476
	Dec. 6,	2,260
1851.	Jan. 3,	2,112

and from that time, until within a month of the opening of the Exhibition, the average number has rarely fallen below 2,000.

Raising of the 72 and 48-feet trusses;

The task of raising to their places the 48 and 72-feet trusses, was accomplished with great facility in the following manner:—A single mast was maintained in a vertical position by ropes, similar to those described as steadyng the shear-legs used for hoisting the girders. From the summit of this mast descended other ropes, with blocks and pulleys, for the purpose of gaining power in lifting. What is called a leading or guide-block, having been attached to the bottom of the mast, a rope passing through it was connected with a yoke drawn by a horse. The mast having been placed close alongside the line in which the roof-trusses had to be fixed, and one end of a rope secured to the truss, the draught of the horse caused the truss to ascend to the necessary height, being steadied in its ascent by other ropes secured to its two ends.

Facilities for the above.

When the truss thus hoisted was fixed in its resting place, the mast was moved along a plank by means of crow-bars, being maintained in a perpendicular position by the alternate slackening and tightening of the cords extending from its head to stakes driven into the ground. Having thus been moved 24 feet, it was ready for the operation of a second hoisting. Two of these great masts, fixed on each side of the transept, were used daily, and in one day as many as seven of the great 72-feet trusses have been raised to their proper position and secured, the apparatus for elevating them having travelled in a vertical position no less than 168 feet.

The beginning of December the time of the climax of activity.

Towards the beginning of December the climax of activity was arrived at, and the most trying operation in the whole construction of the building commenced, namely, the hoisting of the main ribs for the great transept roof. The easiest and at the same time the most secure method of proceeding, with respect to the conduct of this operation, had for some time occupied the attention of the contractors. An ingenious suggestion, made to them by Mr. WILBEE, one of their foremen, was at once adopted, and, with certain modifications, it was promptly carried out.

Framing together of the transept ribs preparatory to raising.

The floor for the lead flat was already completed, so that an admirable stage was prepared upon which to make the necessary arrangements. The ends of the column into which it was designed to drop the ends of the ribs, rose about four feet above

the level of the lead flat, and on the tops of those columns timbers were laid, forming landing stages or tram-ways, to receive the ribs when hoisted. It was of course necessary to raise the ribs sufficiently high above the lead flat to enable their ends to descend upon the tram-ways. To effect this it was determined that two ribs should be placed on end, at a distance of 24 feet from each other, and framed together with purlins and diagonal ties, exactly as they would have to be framed in their finished state. Two complete sets of additional temporary ties were further introduced, to provide for the strain to which the ribs would necessarily be exposed from their altered position in the act of hoisting. The feet of the ribs were securely attached to stout pieces of timber, to afford the means of safely attaching the cords by which they were to be raised. Thus framed together, the ribs were moved on rollers to the centre of the square formed by the intersection of the nave and transept.

On the extra strong trusses which have been described as spanning the nave at this point, two pairs of shear-legs were fixed at 24 feet from one another, and secured by ropes connecting them with distant portions of the building. These hoisting shears consisted of two legs on each side of the transept, each leg being formed of three stout scaffold poles lashed together at the top, and footed on planks laid across the lead flat. The heads of these shear-legs inclining slightly forwards, had connected with them blocks and pulleys from which descended ropes, attached to the four ends of the two ribs. The hoisting ropes connected with the sets of pulleys passed down from the shears to leading blocks, attached to the four columns at the angles of the intersection of the nave and transept. From these guide blocks they were led off diagonally to four powerful crabs, so arranged that the gangs of men employed at each were placed opposite the end of the rib acted upon by the crab they worked; and thus the foreman of each gang was enabled so to regulate the exertions of his men as to make them correspond with those of the remaining gangs, and to maintain the two ends on each side in a perfectly horizontal plane.

As the diameter of the semicircular ribs exceeded the width of the transept by their own thickness, it became necessary, in order that they might pass between the trusses, to commence by raising two of their ends to a considerable height from the ground; and to maintain their diameter at the same angle of inclination until they were hoisted above the columns into which they had to drop. On raising them to a height of about 65 feet from the ground, the highest ends were drawn in a horizontal direction, so as to hang over a portion of the lead flats, and thus room was left to allow the other ends to be lifted to a corresponding height on the opposite side. The ribs were shifted slightly in a horizontal direction until the ends came over the columns, they were then lowered down upon rollers placed upon the tram-ways above mentioned, and by means of these rollers the ribs were moved along to the furthest end of the transept. The place in the centre of the building occupied by the ribs thus hoisted was immediately taken by another pair, which were similarly connected, raised, and moved to within 24 feet of the first pair.

When the whole of the ribs were thus elevated to their places, the spaces between them were filled up with the necessary intermediate ribs and connections; and thus the whole roof was framed together complete.

The raising of the main ribs commenced on the 4th of December, and the whole sixteen were fixed in one week. It occupied about an hour to raise a pair

Provisions for raising.

Raising.

When raised, how fitted together.

Time occupied in raising.

and number of
men required.

Glazing the
transept roof.

Glazing the nave
roof.

Construction of
glazing-
machines;

How used.

Quantity of work
done.

Rapid supply of
small castings.

Celerity with
which the paint-
ing of the nave
roof was executed.

of ribs from the ground to the level of the lead flat, but the previous preparations involved a much longer space of time. Eleven men worked at each crab, and about 16 were employed on the lead flat, to guide the ribs in their ascent, and see to the safe condition of the shear-legs and tackle. Considering the anxious nature of this performance, it must be regarded as a most gratifying circumstance, that the whole operation was accomplished without any untoward occurrence.

No sooner had the skeleton of the transept-roof been completed, than the work of glazing commenced. For a considerable portion of the height of the curve, ladders and temporary scaffolds enabled the workmen to proceed with their labours; but in order to complete the upper part an ingenious box was constructed, moving on wheels in the line of the gutters. This box was lowered down from the lead-flat at the summit to any portion of the roof.

The glazing of the nave roof presented formidable difficulties, from the great extent of work to be got through in so short a space of time. The ingenuity of the contractors was, however, brought to bear upon the subject, and provisions were made by them for the simultaneous glazing of large areas, entirely independent of variations of weather. 76 machines were constructed, each capable of accommodating two glaziers; these machines consisted of a stage of deal about 8 feet square, with an opening in its centre sufficiently large to admit of boxes of glass, and supplies of sash-bars, putty, &c., being hoisted through it. The stage rested on four small wheels, travelling in the Paxton gutters, and spanned a width consisting of one ridge and two sloping sides. In bad weather the workmen were covered by an awning of canvas, stretched over hoops for their protection.

In working, the men sat at the end of the platform next to whatever work had been last done; from which they pushed the stage backward sufficiently far to allow them to insert a pane of glass, and as soon as that was completed they moved again far enough to allow of the insertion of another. In this manner each stage travelled uninterruptedly from the transept to the east and west ends of the building. The dexterity acquired by the men in working the machines was very remarkable. By means of them 80 men in one week put in upwards of 18,000 panes of glass, being not less than 62,600 feet superficial. The greatest number of panes inserted by a man in one day was 108, being 367 feet 6 inches of glazing. A somewhat similar machine has been constructed for the purpose of effecting any repairs that may be necessary in the finished roof, with the difference that its wheels travel upon the ridges instead of in the gutters, and that of course there is no aperture for the purpose of hoisting.

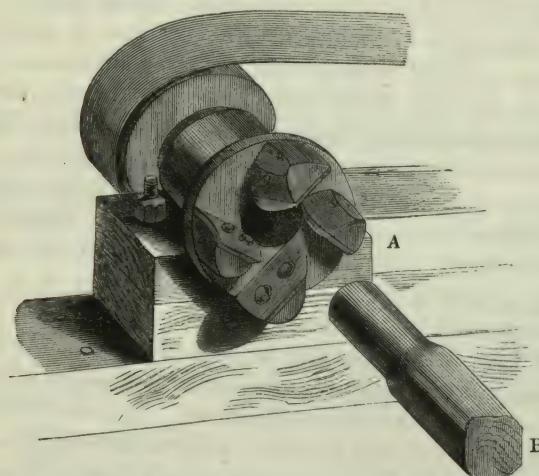
Taking into account the innumerable quantity of small castings requisite, and the extreme rapidity with which they had to be supplied, their quality and cleanliness is truly remarkable; and the fact of their having all issued from one foundry, that of the contractors at Smethwick, proves the great facility with which work of that nature can be executed in England.

Among the later operations connected with the completion of the work, the most remarkable for the celerity with which it was conducted, was the ornamental painting of the nave roof. Iron straps, attached to the trusses, supported a number of scaffold poles, on which a perfect cloud of boards was laid, and as many as between 400 and 500 painters, by these means, worked their way, with extreme rapidity, from one end of the building to the other.

The magnitude of this great building elevated into serious undertakings matters which, under ordinary circumstances, are accounted little more than trifles. Hence machinery was applied to the formation of the entire length of hand-rail required for the galleries. In fig. 33 is represented a set of cutters (A fig. 33), by exposure to the rapid revolution of which, roughly-shaped strips of mahogany were instantaneously converted into smooth and cleanly rounded hand-rails (B fig. 33). A little sand-paper and French-polish sufficed to bring them to their present excellent condition.

The application
of machinery to
make the gallery
hand-rails.

Fig. 33.



In summing up the description of any great engineering undertaking, it is too often a painful task to have to record the loss of life so frequently involved. Considering the difficulties of construction, the necessary perils to which the workmen were exposed, and their habitual imprudence, arising, partly, from real indifference to danger, and partly from bravado, it has been a source of congratulation that, in the performance of this contract, but very few accidents have occurred, and those, with two or three exceptions, of a slight nature.

Having now brought to a close our description of the building as it exists, and of the processes by which its existence has been developed, it remains only to reiterate our conviction that the courage, energy, and strength represented by its construction should be regarded by every Englishman with emotions conducive to some yet higher manifestation of national capability; and at the same time to express a hope that the products of British industry (of which the building is but the shrine), may display, in a yet higher degree and in a yet more tangible and varied form, the sources of COMMERCIAL POWER, so many indications of which it has been our happy privilege to trace in the edifice itself.

M. DIGBY WYATT.

SCIENTIFIC REVISION AND PREPARATION OF THE CATALOGUE.

Peculiar circum-
stances of pro-
duction of Cata-
logue.

THE circumstances under which this work is published appear to call for some observations upon the method of its production. From the fact that it is without a precedent in the annals of literature, it follows that its preparation and publication have been attended with peculiar, because unforeseen, difficulties. All those obstacles in the way of its completion which would necessarily develop themselves from the remarkable manner in which its contents have been created, and from the want of a guiding experience in the publication of works of this nature, have been contended with in its progress to a perfect state. The following may be considered as an outline of the manner in which the materials for the construction of this volume were collected, and of the system adopted to reduce them to a definite form, and as far as possible to a certain degree of consistency of expression and of harmony of proportion.

Exhibitors the
authors.

It is not the least remarkable fact in connection with the Great Exhibition, that the Catalogue may be really regarded as the production of many thousands of authors,—represented by exhibitors themselves. By a decision of the Executive Committee, every exhibitor was required, prior to the reception of his articles at the Building, to have filled up a certain printed form, containing a description of his productions in the English language, accompanied with such general observations as might be suggested by the peculiar character of the things described and intended for exhibition. These forms, which were to be to the Catalogue what the MS. of an author is to his proposed work, were framed with care, and were accompanied with instructions for filling them up, which suggested those points on which interesting or important information might be supplied, together with the descriptive account. There were four varieties, each appropriated to one of the four great sections of Raw Materials, Machinery, Manufactures, and Fine Arts. The essential characters of these forms were similar in each section, but the instructions for filling them up differed necessarily with the peculiar differences suggested by each section. The subjoined form represents that used in sending in descriptions of machinery, and is a type of those used in the other sections:—

Catalogue form.

List of Articles of MACHINERY to be exhibited by

Exhibitor's Surname. _____ Christian Name.

Country. _____ Address, stating nearest Post Town.

Capacity in which the Exhibitor appears, whether as *Producer, Importer, Manufacturer, Designer, Inventor, or Proprietor.*

No.
of Articles.

DESCRIPTIONS.

In order to facilitate their classification on being returned by exhibitors, the forms in the four different sections were printed in black, blue, red, and yellow, the latter applying to sculpture and fine art, the former to raw materials, and the intermediate ones respectively to machinery and manufactures. Every exhibitor was required to send in one of these forms, accompanied with a duplicate in every respect similar to it, and in so doing was supplied with a "receipt for catalogue forms," which was a guarantee for the reception of his goods into the Building. A very large number of these forms were printed and supplied to Local Committees, and to all exhibitors who applied for them. The instructions for filling them up were as follows:—

Classification of the forms.

RULES FOR COMPILING THE CATALOGUE.

The Executive Committee are desirous of impressing upon Exhibitors that the formation of the Catalogue which, however great may be its bulk, must necessarily be compiled and printed in a very short time, will be much facilitated, if Exhibitors will have the kindness to follow the rules hereinafter prescribed when they furnish the descriptions of the Articles as they wish them to appear in the Catalogue.

1. Every Exhibitor should write the description of every Article or series of Articles he exhibits, on paper of the same size as the present page (namely, about 13 inches by 8 inches). The paper must be written *on one side only*. There should be a margin of one inch at the left side of the page.

2. Should the description extend beyond a single page, each separate page must be marked with the Exhibitor's name, and numbered consecutively, both at the head and foot.

3. To prevent errors in compilation and misprinting, it is desirable the handwriting should be *very clear*, especial care being taken with all names and technical terms.

4. It is indispensable that each Exhibitor should furnish the following particulars, and in the exact order prescribed:—

- I. Exhibitor's surname Christian name.
- II. Country Address, stating the nearest Post Town.
- III. Capacity in which the Exhibitor appears, whether as Producer, Importer, Manufacturer, Designer, Inventor, or Proprietor.
- IV. The name and description of every Article of importance or class of Articles exhibited; each Article or Class beginning a separate paragraph, *e. g.*—
 - a* Specimens of dyed Cottons, &c.
 - b* Specimens of dyed Silks, &c.

5. It is necessary that the descriptions of the Articles should set forth, as far as may be practicable, the following particulars:—

As respects Articles to be exhibited

In SECTION 1. RAW MATERIALS and PROCESSES, the descriptions should specify—

- a* The commercial name in English, French, and German.
- b* The scientific name.
- c* The place where obtained; the name of the mines and period they have been worked, should be given with minerals.
- d* The place where exported.
- e* The uses.
- f* The consumption.
- g* The superior excellence of the particular Specimens.
- h* In the case of processes, such as dyes, or prepared materials, such as mixed metals; it should be stated whether the Article is patented or not. The novelty and importance of the prepared product, and the superior skill and ingenuity manifested in the process of preparation should also be very briefly pointed out.
- i* Where price is an element for consideration, the price at which the importer or producer can sell the Article.
- j* Any particular features which the Exhibitor desires to be noticed by the Jury.

In SECTION 2. MACHINERY, the descriptions should specify—

- a* The uses.
- b* The novelty, if any, in the invention.
- c* Superiority of execution.
- d* Increased efficiency or economy.
- e* The importance of the Article in a social or other point of view.
- f* The place where produced.
- g* Whether the Article is patented or not.
- h* Where price is an element for consideration, the price at which the producer can sell the Article.
- i* Any particular features which the Exhibitor desires to be noticed by the Jury.

In SECTION 3. MANUFACTURES, the descriptions should specify—

- a* The uses.
- b* The novelty.
- c* Superiority of execution.
- d* Improved forms or arrangements.
- e* Increased efficiency or economy.
- f* New use of known Materials.
- g* Use of new Materials.
- h* New combinations of Materials.
- i* Importance of the Article in a social or other point of view.

- j* The place or places where manufactured.
- k* Whether the Manufacture is patented; whether the design is registered.
- l* Where price is an element for consideration, the price at which the importer or manufacturer can sell the Article.
- m* Any particular features which the Exhibitor desires to be noticed by the Jury.

Fine Arts.

In SECTION 4. **FINE ARTS, MODELS, SCULPTURE, and PLASTIC ART**, the descriptions should specify—

- a* The name of the Artist or Designer, if the same should not be the Exhibitor.

- b* The uses.
- c* The novelty in design or treatment.
- d* Superiority of execution.
- e* New use of known Materials.
- f* Use of new materials.
- g* New combination of Materials.
- h* Improvements in processes of production.
- i* The place where the Article was made.
- j* If the Article is repeated in quantities for trade, the price at which it is sold by the Producer should be stated.
- k* Any particular features which the Exhibitor desires should be noticed by the Jury.

6. Exhibitors are required to make their descriptions brief, and to confine them as much as possible to facts.

7. Two COPIES, in the English Language, of the Exhibitor's descriptions, both being precisely alike, must be furnished before the Articles can be permitted to enter the Building. If an Exhibitor's Articles are sent in several packages, the list should indicate the contents of each separate package.

8. Her Majesty's Commissioners have consented to allow Illustrations of Articles exhibited to be inserted in the large Catalogue, after approval by the Executive Committee. Exhibitors desirous to avail themselves of this privilege must communicate their intention of providing the Illustrations, and state their character, whether Engraving on Wood, on Steel, or Lithography. Communications are to be addressed to the Executive Committee, at the Building for the Exhibition, Hyde Park, London, marked on the outside, "CATALOGUE."

9. Exhibitors who may desire that their names and the descriptions of their productions should appear in any French and German Editions of the Catalogue which may be authorized, are requested to furnish at the same time with the two *English* Copies, a French and German translation of the descriptions, made out in all respects as before prescribed.

That a careful attention to these instructions would have developed a vast amount of most valuable and interesting knowledge, can scarcely be questioned; and that in a considerable proportion of cases such has been the result, will appear

Attention paid to on examination of the contents of this volume. That such a degree of attention Rules.

Attention paid to on examination of the contents of this volume. That such a degree of attention was not universal is only what was to have been expected, both in consequence of the pressure of time under which many exhibitors laboured, and also from the fact that a large proportion, occupied in exclusively industrial pursuits, were unused to literary composition. The forms, with their duplicates, on being filled up, were transmitted to the Executive Committee; the duplicate being retained by the Executive, the other copy was placed in the compilers' hands.

The first step in preparing these forms for the press was their arrangement into classes corresponding to the thirty divisions decided upon by the Executive. The number and variety of objects embraced by the returned forms rendered this a tedious and difficult task. On its being effected, the forms remained to be examined, and put into such a state as to satisfy the requirements of the printer. They were consequently read, and as far as possible thrown into that state of connection of parts, and removal of superfluous material, which might enable them to be set up in a convenient form in type.

Although much had been by these means effected in the preparation of the material of the catalogues, the most important part of the labour involved, prior to its assuming its present form, remained to be accomplished. The scientific and technical inaccuracies of a large proportion of the returned forms, together with their literary reconstruction rendered in a large proportion of cases absolutely necessary, demanded attentive revision and correction. Several considerations rendered this extremely difficult. Among these were the shortness of the period absolutely allotted for the completion of the work, the impossibility of verifying the descriptions given with the objects of which they treated, and the immense variety of subjects comprehended by the Exhibition itself, and necessarily described

First stage of preparation for printing.

Scientific revision and correction.

in these forms in a manner in many instances more or less imperfect. The occasion called for a large amount of peculiar knowledge—of knowledge not to be gained by study, but taught by industrial experience, in addition to that higher knowledge, the teaching of natural and experimental philosophy. To meet these requirements the following plans were devised, and carried into operation. A Plans adopted.

number of scientific gentlemen gave their consent to undertake the revision and correction of proofs of the returned forms in their peculiar departments, with a view to remove from them those errors which might present themselves, and to supply what might appear requisite to give prominence to their really important features. In addition to this it appeared advisable, as critical observations were necessarily inadmissible, to relieve the tedium of mere description, and to assist in pointing out the leading features of interest in the objects described, or in direct relation with them, by appending, as the subjects of the proofs suggested, such brief annotations as might appear best calculated to effect these objects.

As a certain degree of harmony of procedure was considered absolutely necessary, in order to give a consistent character to such corrections and annotations, supplied as they would be from a variety of sources, a few suggestions of certain general principles were adopted, and as far as possible acted upon. It is not necessary to reproduce the whole of these suggestions in their original form; but since it is important that exhibitors should be informed of the principles which, to a great extent, guided and determined the corrections and annotations which are found in this work, they are here subjoined. Attention is particularly directed to suggestion 5, under the head annotations, by which it will be perceived that the character of critical notices has been strictly excluded from the annotations appended to the descriptions in this work.

Suggestions as to principles of correction and annotation.

1. *Corrections.* These will be chiefly of the following kind:—

1. To correct in a general way any obvious typographical inaccuracies.
2. To correct with care all technical and scientific errors in names, places, and things.
3. Occasionally, if time permit, to recast badly composed sentences or expressions.
4. To delete redundancies and self-laudatory terms, or expressions that could in any way be so construed, or critical and extraneous statements.

Corrections.

2. *Annotations.* Many of the proofs will undoubtedly suggest interesting elucidatory notes. Annotations. As it is desirable that the same notes should not be repeated, the information which, under other circumstances, or in a volume of a different kind, it would be well to present in a mass, may be conveniently subdivided, and a portion appended to the most appropriate proofs on the subject to which it refers. Thus, for a vegetable or animal product, a line or two as to its history might be attached to one proof, a note upon the natural order or tribe yielding it to another, the uses to a third, the commercial importance, &c., to a fourth, &c. In the selection of proofs for annotation, those of course will be preferred which are in themselves the most interesting and suggestive. It is considered desirable that these notes should as far as possible partake of the following characters:—

1. To be as short, clear, and definite as possible.
2. To have reference, as far as may be, if the article cannot be seen—
 - a. To the article as described by the Exhibitor.
 - b. To its uses, history, consumption, production, &c. (See Memorandum for the instruction of Exhibitors in preparing the descriptions contained in forms for the Catalogue.)
3. To be of the following average length—
 - a. *Articles of primary importance*, as, for example, "cotton," "iron," "steam-engine," and such like, eight or ten lines.
 - b. *Articles of secondary importance*, four and three lines.
4. The same annotations not to be repeated or appended to more than one proof.
5. **OBSERVATIONS OF A CRITICAL CHARACTER, IN EITHER SENSE OF THAT TERM, ARE INADMISSIBLE.**

Character of.

So soon as the work actually commenced, a mechanical difficulty of no common proportions presented itself. On the distribution of proofs for the purpose of Difficulties attending transmission and return of proofs. annotation and correction, they were necessarily cut up into separate portions,

which had destinations as far distant as Germany and remote parts of the United Kingdom, whither they were despatched for the purpose of ensuring their scientific and technical accuracy. Many thousand proofs were thus scattered in various directions, yet all were required to be gathered together again, and arranged precisely in the same form and order as that assumed prior to their dispersion. Some of these proofs were not more than three inches long, and not broader than a narrow ribbon, containing only two or three lines; the difficulty of determining and immediately affixing the proper place of such a minute strip in a work of such magnitude as the present, seemed to be great. A simple method of ascertaining not merely the place in the catalogue, but its entire history, its destination, annotator, and return was, however, contrived, and the history of every proof has thus been accurately recorded. The information thus obtained, was so accurate and precise, that on the temporary delay of very small proofs, their original destination was instantly discovered, together with the date of transmission, and the name of the annotator to whom they had been sent. Much punctuality characterized the return of the dismembered portions of this large volume. Had not such been the case, the original plan of scientific and technical revision could not have been persisted in. As a general rule, it was considered advisable to limit annotations to an average of eight or ten lines in length; but in certain instances, where peculiar technical, local, or scientific information has been available, this rule has been to a very considerable extent departed from.

Record of history
of proofs.

Technological
mistranslations.

The language of the arts among various nations has always been regarded as of extreme difficulty in translation. A considerable portion of this work is necessarily written in this language, and it is therefore to be expected that, notwithstanding the precautions employed, errors of description may occur in those parts of it which describe the productions of foreign exhibitors. It is requested that these may be pointed out. In a number of instances technical terms have been explained by notes. As far as it was possible foreign weights and measures have been converted into English.

Mottoes selected
by Prince Albert.

The mottoes on the title-pages of this work were selected and placed by HIS ROYAL HIGHNESS PRINCE ALBERT.

Catalogue val-
uable as illus-
trative of the sci-
ence of trades.

There is a peculiar feature in this Catalogue to which attention requires to be directed. This is the fact, that it embodies to a large extent the science of commerce. An attempt has been made here to convert the changing and inaccurate conventional terms of trade into the precise and enduring expressions of science. In classes 1 to 4 of the Exhibition, are contained specimens of a vast proportion of the raw materials upon which human industry daily operates throughout the world. In the majority of the descriptions of the articles exhibited in these four classes, will be found the commercial names of the materials, together with their scientific equivalents. As an instance, may be mentioned the woods employed for furniture, which are enumerated, with their commercial names, their Latin names, their native habitats, and the uses to which they are applicable. In the present edition of this work, prepared as it has necessarily been under highly unfavourable circumstances as to accuracy and correction, this attempt may not be as successful as in future editions; but such arrangements are made in order to obtain this important and valuable result, as will render future editions of this Catalogue permanently valuable in this respect, not only to the naturalist, but also to commercial men. That this feature of the Catalogue will not be without

its fruit in the promotion of the objects of industry, may be expected from the knowledge of the fact, that hitherto, in consequence of the absence of such information in a collected form, the greatest difficulties have been experienced by commercial men in their endeavours to introduce into trade any new material of industrial importance, or to obtain adequate supplies of materials already known,—but known under a variety of changing, local and unintelligible terms. In the seventeenth century, ROBERT BOYLE perceived the important results likely to arise from the “naturalist’s insight into trades.” It may be hoped that such results will now not fail of their accomplishment.

The smaller Catalogue is an abstract of the present work. It was prepared by Abridged Catalogue. condensing the revised and corrected slips forming the Illustrated Catalogue. For economy of space it was necessary to confine the descriptions in that work to an average length of three or four lines.

On the first announcement of a descriptive Catalogue, erroneous ideas as to its size prevailed, to so large an extent as to lead to the fear that a sufficiency of type of the kind required could scarcely be obtained within the necessary time. Statements appeared which gave birth to the opinion that such a work could not be contained in less than ten volumes of eight hundred pages each; and for a considerable time it seemed probable that at least three such volumes would be size. required to complete this record of universal industry. It was soon rendered apparent that the estimates thus formed were incorrect. The articles exhibited by a large proportion of exhibitors—as in textile manufactures—were of a kind which did not admit of descriptions at length; and the returned forms of such articles were generally received written in the customary abbreviated language of commerce. In cases of another kind, where descriptions at greater length were not only admissible, but desirable, economy of space has been obtained by the adoption of a condensed style. The descriptive Catalogue has thus been reduced, notwithstanding the addition of annotations, to a convenient size.

That a work produced under the circumstances in which this Catalogue appears should contain inaccuracies, can less be cause of surprise than would its complete accuracy. One of the greatest obstacles to its correctness has been the delay of the return forms, which continued to arrive up to the period of going Delay of forms. to press, and the incompleteness of the arrangements of many of the exhibitors at the time when the work required to be prepared for issue. In its preparation, however, an attempt has been made to communicate to it a value enduring beyond that of the occasion of its production. The vast and wonderful accumulation of the products of human industry, of which it professes to be the exponent, is gathered only for a time. The intention of this Great Collection accomplished, and its objects realized, the industrial store must again be scattered among the nations contributing to its gathering. But this record of the history of the Great Exhibition must endure beyond the duration of the Exhibition itself. May it remain to indicate to other times the successful accomplishment of the greatest conception of our own, and the favour of the Divine Providence effecting that result.

ROBERT ELLIS.

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 Classification of Subjects in the Thirty Classes into which the Exhibition is divided,
 by Dr. LYON PLAYFAIR, F.R.S.
 Compilation by G. W. YAPP.

Technical information and assistance have also been rendered by Mr. G. TAYLOR, Mr. T. BATTAM,
 Mr. H. MAUDSLAY, Professor WALLACE, M.A., Mr. C. TOMLINSON, Mr. JOHN GRAHAM, and other
 Gentlemen.

CLASSIFICATION OF SUBJECTS IN THE THIRTY CLASSES INTO WHICH
THE EXHIBITION IS DIVIDED.

CLASS.

RAW MATERIALS.

- I. Mining, Quarrying, Metallurgical Operations, and Mineral Products.
- II. Chemical and Pharmaceutical Processes and Products generally.
- III. Substances used for Food.
- IV. Vegetable and Animal Substances, chiefly used in Manufactures, as Implements, or for Ornament.

MACHINERY.

- V. Machines for direct use, including Carriages and Railway and Naval Mechanism.
- VI. Manufacturing Machines and Tools.
- VII. Civil Engineering, Architectural, and Building Contrivances.
- VIII. Naval Architecture and Military Engineering; Ordnance, Armour, and Accoutrements.
- IX. Agricultural and Horticultural Machines and Implements.
- X. Philosophical Instruments and Processes depending upon their use; Musical, Horological, and Surgical Instruments.

MANUFACTURES.

- XI. Cotton.
- XII. Woollen and Worsted.
- XIII. Silk and Velvet.
- XIV. Manufactures from Flax and Hemp.
- XV. Mixed Fabrics, including Shawls, but exclusive of Worsted Goods (Class XII.).
- XVI. Leather, including Saddlery and Harness, Skins, Fur, Feathers, and Hair.
- XVII. Paper and Stationery, Printing and Bookbinding.
- XVIII. Woven, Spun, Felted, and laid Fabrics, when shown as specimens of Printing or Dyeing.
- XIX. Tapestry, including Carpets and Floor-cloths, Lace and Embroidery, Fancy and Industrial Works.
- XX. Articles of Clothing for immediate personal or domestic use.
- XXI. Cutlery and Edge Tools.
- XXII. Iron and General Hardware.
- XXIII. Working in precious Metals, and in their imitation, Jewellery, and all articles of Virtu and Luxury, not included in all other Classes.
- XXIV. Glass.
- XXV. Ceramic Manufactures, China, Porcelain, Earthenware, &c.
- XXVI. Decoration Furniture and Upholstery, including Paper-hangings, Papier Maché, and Japanned Goods.
- XXVII. Manufactures in Mineral Substances, used for building or decoration, as in Marble, Slate, Porphyries, Cements, Artificial Stones, &c.
- XXVIII. Manufactures from Animal and Vegetable Substances, not being Woven or Felted, or included in other Sections.
- XXIX. Miscellaneous Manufactures and Small Wares.

FINE ARTS.

- XXX. Sculpture, Models, and Plastic Art.

I. Mining, Quarrying, Metallurgical Operations, and Mineral Products.

A. MINING AND QUARRYING OPERATIONS.

1. Quarries and open workings.
2. Streaming; washing alluvial deposits.
3. Mines worked on the lode.
 - a. Sinking of shafts.
 - b. Cutting adits.
 - c. Driving levels.
4. Mines worked on the bed.
 - a. Sinking shafts.
 - b. Driving levels.
 - c. Cutting stalls or headings.
5. Salt deposits.
6. Ventilation; Safety Lamps, and other modes of Lighting.
7. Methods of raising Men, Ore, and Water.
 - a. Raising Ore.
 - b. Lowering and raising Miners.
 - c. Draining.

B. GEOLOGICAL MAPS, PLANS, AND SECTIONS.

C. ORES AND METALLURGICAL OPERATIONS.

1. Ores and the Methods of dressing and rendering Ores merchantable.
 - a. Ores of the more common Metals, as of Iron, Copper, Zinc, Tin, Lead.
 - b. Native Metals, as Gold, Silver, Copper, &c.
 - c. Ores used for various purposes, without reduction, as Peroxide of Manganese, &c.
2. Methods of roasting, smelting, or otherwise reducing Ores.
 - a. The common Metals, as Iron, Copper, Zinc, Tin, Lead.
 - b. The Metals more generally used in combination, as Antimony, Arsenic, Bismuth, Cadmium, Cobalt, Nickel, &c.
3. Methods of preparing for use the nobler Metals, as Gold, Silver, Mercury, Palladium, Platinum, &c.
4. Adaptation of Metals to special purposes.
 - a. Metals in various Chemical states, as Iron in the condition of Cast and Malleable Iron, Steel, &c.
 - b. Metals in their progress to finished Manufactures, as Pigs and Ingots, Sheets, Bars, Wires, &c.
5. Alloys, and methods of rendering more generally useful Metals and their alloys—
 - a. Statuary, Bronze, Gun, Bell, and Speculum Metals.
 - b. Brass, and alloys used as a substitute for it.
 - c. White alloys, as Britannia Metal, German Silver, Pewter, &c.
 - d. Type, Sheathing Metals, and other alloys.

D. NON-METALLIC MINERAL PRODUCTS.

1. Minerals used as Fuel—
 - a. All kinds of Coal and derived products.
 - b. Lignite and Peat
 - c. Bituminous bodies and "native Naphtha."
2. Massive Minerals used in construction.
 - a. For purposes of construction generally— Siliceous or Calcareous Free Stones and Flags. Granites, porphyritic and basaltic Rocks. Slates.
 - b. For purposes of Ornament, Decoration, and the Fine Arts— Marbles. Alabaster, Spar, &c. Serpentine and other hard rocks susceptible of high polish.
- c. Cements and Artificial Stones— Calcareous and Hydraulic Cements. Puzzolanas, Trass, &c. Gypsum for plaster. Artificial Stones.
3. Minerals used in the manufacture of Pottery and Glass— Sands, Limestones, &c., for Glass-making. Various Clays and felspathic Minerals, as those used for Bricks, Tiles, and various kinds of Pottery and Porcelain. Siliceous, Calcareous, and other Minerals, used in Plastic Arts.
4. Minerals used for personal Ornaments, or for Mechanical and Scientific purposes.
 - a. Gems and Precious Stones.

- b. Models of Minerals and Crystals, &c.
- c. Collections of Minerals for scientific or educational use.

5. Minerals used in various Arts and Manufactures.

- a. Simple bodies or compounds containing the Alkalies or Alkaline Earths— Those used principally for culinary purposes or for Medicine, as Salt, Mineral Waters, &c. Those used in various manufactures, as Sulphur, Borax, &c.
- b. Earthy and semi-crystalline Minerals. Minerals used for grinding and polishing, as Grindstones, Honestones, Emery, &c. Lithographic Stones, Drawing Chalks, and Slate Pencils. Graphite. Earthy and other Minerals used as pigments, or for staining, dyeing, and colouring. Various Minerals used in Manufactures; as Alum Schist, Fuller's Earth, French Chalk, Casting Sands, &c.
6. Soils and Mineral Manures.

II. Chemical and Pharmaceutical Processes and Products generally.

A. CHEMICAL SUBSTANCES USED IN MANUFACTURE.

1. From the Mineral Kingdom.
 - a. Non-metallic substances. Those used principally in their elementary state, as Sulphur, Phosphorus, &c. Acids, as Sulphuric, Muriatic, Nitric, Boracic, &c. Miscellaneous Manufactures, as Sulphuret of Carbon, Chloride of Sulphur, &c.
 - b. Alkalies, Earths, and their compounds. Alkalies and their Alkaline Salts, as Soda, Potash, Ammonia, and the Carbonates, &c. Neutral Salts of the Alkalies, as Sulphate, Nitrate of Soda, Saltpetre, Borax, &c. Earths and their compounds, as Lime, Magnesia, Barytes, Strontia, Alumina, &c.
 - c. The compounds of Metals proper, as Salts of Iron, Copper, Lead, &c.
 - d. Mixed Chemical Manufactures, as Prussiate of Potash, &c.
2. From the Organic Kingdom, and not included in Sections III. and IV.
3. Manufactured Pigments, Dyes, and miscellaneous Chemical Manufactures. (See also Section IV.)
 - a. Pigments employed in House Decoration, and for colouring Woods.
 - b. Pigments used for Textile Fabrics.
 - c. Pigments used for Paper Hangings, and for felted and laid Fabrics generally.
 - d. Artists' Colours.
 - e. Miscellaneous Chemical Manufactures.

B. RARER CHEMICAL SUBSTANCES, MANUFACTURED CHIEFLY FOR THE USE OF THE SCIENTIFIC CHEMIST.

1. From Substances of the Mineral Kingdom.
2. " Vegetable ",
3. " Animal ",

C. CHEMICAL SUBSTANCES USED IN MEDICINE AND IN PHARMACY.

1. From the Mineral Kingdom.
 - a. Non-metallic substances and their compounds.
 - b. Alkalies, Earths, and their compounds.
 - c. Metallic Preparations.
2. From the Vegetable Kingdom, when shown for Pharmaceutical purposes. (See also Sections III. and IV.)
 - a. Vegetable Infusions, Decoctions, and Solutions, clear or saccharine.
 - b. Tinctures.
 - c. Extracts and Inispissated Juices.
 - d. Resins, Gum Resins, and Oleo Resins and Balsams.
 - e. Aloes, &c.
 - f. Gums as Acacia, Tragacanth, &c.
 - g. Essential Oils, Cajeput, Savine, Turpentine, &c.
 - h. Fixed Oils, as Castor, Croton, Almond, Olive, &c.
 - i. Vegetable parts, as leaves of Digitalis, Hemlock, roots of Jalap, Ipecacuanha, &c.
 - j. Barks as imported, Cinchona, Cascarilla, Cusparia, &c.

- k. *Vegeto-Alkalies, their Salts and other Crystalline principles of medicinal substances.*
- l. *Vegetable Acids.*
- m. *Miscellaneous Compounds.*
- 3. *From the Animal Kingdom.*
 - a. *Cod-liver and other Animal Oils for internal or external application.*
 - b. *Unguents of Spermaceti, Lard, Oil, and combinations of them.*
 - c. *Antispasmodics, as Musk, Castoreum, Civet, Ambergris, &c.*
 - d. *Phosphorus, Ammonia, and their products.*
 - e. *Irritants, as Cantharides.*
 - f. *Antacids, as Crabs' eyes, Calcareous concretions of the Craw-fish, Cuttle-bone, &c.*

III. Substances used as Food.

VEGETABLE KINGDOM.

- A. *AGRICULTURAL PRODUCE—CEREALS, PULSES, OIL, SEEDS, ETC.*
 - 1. *Common European Cereals.*
 - 2. *Cereals more rarely cultivated in Europe.*
 - 3. *Millet and other small Grains used as food.*
 - 4. *Pulses and Cattle Food.*
 - 5. *Grasses, Fodder Plants, and Agricultural Roots.*
 - 6. *The Flours or preparations of the above classes.*
 - 7. *Oil Seeds and their Cakes.*
 - 8. *Hops and other aromatic plants used for like purposes.*
- B. *DRIED FRUIT AND SEEDS.*
 - 1. *Raisins, Currents, Figs, Plums, Cherries, Apricots, &c.*
 - 2. *Dates, Tamarinds, Dried Bananas, &c.*
 - 3. *Almonds, Chestnuts, Walnuts, &c.*
 - 4. *Cocoa-nuts, &c.*
- C. *SUBSTANCES USED IN THE PREPARATION OF DRINKS.*
 - 1. *Real Teas of all kinds.*
 - 2. *Substitute for Teas, as Paraguay, Arabian, Ben-coolin, &c.*
 - 3. *Coffee of all kinds, and Cocoa Seeds and Nibs.*
 - 4. *Various substances, as Chicory Roots, Amande de Terre, Guarana Bread, &c.*
- D. *INTOXICATING DRUGS, FERMENTED LIQUORS, AND DISTILLED SPIRITS FROM UNUSUAL SOURCES.*
 - 1. *Fermented Liquors and Spirits from unusual sources.*
 - 2. *Tobacco.*
 - 3. *Opium.*
 - 4. *Hemp, and other Intoxicating Drugs.*
- E. *SPICES AND CONDIMENTS.*
 - 1. *Cinnamon, Cassia, and their substitutes.*
 - 2. *Nutmegs and Mace; Cloves and Cassia Buds.*
 - 3. *Peppers, Capsicum, Mustard, Vanilla, Pimento, Cardamums, &c.*
 - 4. *Ginger, Turmeric, &c.*
- F. *STARCH SERIES.*
 - 1. *Starches of all kinds prepared from Wheat, Rice, Potatoes, Maize, &c.*
 - 2. *Arrowroots of all kinds, Tous les Mois.*
 - 3. *Sagos from the Palms, Cassava, Tapioca, &c.*
 - 4. *Lichens of all kinds.*
 - 5. *Other Starchy Substances, as Portland Sago from *Arum Maculatum*, and from various like plants.*
- G. *SUGAR SERIES.*
 - 1. *Sugars from the Cane and Beet.*
 - Maple and Palms.
 - Birch, Poplar, Oak, and Ash.
 - Grape Sugar.
 - 2. *Liquorice, Sarcocoll, &c.*

ANIMAL KINGDOM.

- H. *ANIMAL FOOD AND PREPARATIONS OF FOOD AS INDUSTRIAL PRODUCTS.*
 - 1. *Specimens of preserved Meats.*
 - 2. *Portable Soups, and concentrated nutriment, as consolidated Milk, &c.*
 - 3. *Caviare, Trepang, &c.*
 - 4. *Articles of Eastern commerce, as Shark Fins, Nest of the Java Swallow, &c.*
 - 5. *Honey and its preparations.*
 - 6. *Blood and its preparations.*
 - 7. *Industrial Products, as Glue, Gelatine, Isinglass, Gluten, &c.*

IV. *Vegetable and Animal Substances, chiefly used in Manufactures, as Implements, or for Ornaments.*

VEGETABLE.

- A. *GUM AND RESIN SERIES.*
 - 1. *Gums of all kinds of natural occurrence—Gums made artificially, as British Gum, Mucilaginous Seeds, Barks, Pods, and Seaweeds.*
 - 2. *Resins—Resins and Balsams of all kinds. Gum Resins. Gum Elastics and Gutta Percha. Distilled Resins and Varnishes.*
- B. *Oil Series.*
 - 1. *Volatile Oils, including Camphor.*
 - 2. *Drying Fat Oils.*
 - 3. *Non-drying Fat Oils.*
 - 4. *Solid Oils.*
 - 5. *Wax.*
 - 6. *Distilled Fat Oils.*
- C. *ACIDS, AS ACETIC, CITRIC, TARTARIC, OXALIC, &c.*
- D. *DYES AND COLOURS.*
 - 1. *Indigos.*
 - 2. *Madders.*
 - 3. *Lichens and their preparations.*
 - 4. *Dyeing Barks, as Acacias, Quercitron, Mangrove, &c.*
 - 5. *Woods, as Logwood, Brazil wood, Peach wood, Fustics, &c.*
 - 6. *Flowers and Berries, as Persian Berries, Safflower, Saffron.*
 - 7. *Miscellaneous, as Turmeric, &c.*
- E. *TANNING SUBSTANCES.*
 - 1. *Pods, Berries, Seeds, and Fruits of various kinds, as *Algaroab*, *Acacia*, Nib-nib and *Divi-divi* Pods, &c.*
 - 2. *Barks of various kinds, as Barks of the Babool, Brazilian Acacias, Murici, Bucida, Gordonia.*
 - 3. *Galls, and similar Tanning Materials.*
 - 4. *Catechu, Kino, Gambeer, &c.*
- F. *FIBROUS SUBSTANCES, INCLUDING MATERIALS FOR CORDAGE AND CLOTHING.*
 - 1. *Cottons of all kinds.*
 - 2. *Hemp and Flax; Manilla Hemp and New Zealand Flax.*
 - 3. *China Grass, Nettle Fibre, Plantain, and Pine Apple Fibre.*
 - 4. *Sunn, Jute, and other tropical substitutes for Hemp, Flax.*
 - 5. *Coir, or Cocoa-Nut Fibre, Gomuti, &c.*
 - 6. *Rushes and Miscellaneous Substances.*
- G. *CELLULAR SUBSTANCES.*
 - 1. *Corks of all kinds.*
 - 2. *Woods and Roots used for Corks, as the *Ochroma lagopus* and *Anona palustris**
 - 3. *Rice-paper of China.*
 - 4. *Birch Bark, Pottery Bark, Citrus Rind, &c.*
 - 5. *Substances used as Amadou.*
- H. *TIMBER AND FANCY WOODS USED FOR CONSTRUCTION AND ORNAMENT, AND PREPARED BY DYEING.*
 - 1. *Suited chiefly for purposes of construction, or for the Navy.*
 - 2. *Suited chiefly for Ornamental Work.*
 - 3. *Prepared Woods, as by Kyan's, Payne's, Bethell's, and Boucherie's processes.*
- I. *MISCELLANEOUS SUBSTANCES.*
 - 1. *Substances used as Soap, as Quillai Bark, Soap Berries (*Sapindus saponaria*), Soap Roots (*Saponaria officinalis*, &c.).*
 - 2. *Perfumes, as Pucha Pat, Vetiver, Spikenard, Tonka beans, &c.*
 - 3. *Substances used mechanically, as Teazels, Dutch Rushes, &c.*
 - 4. *Seeds and fruits used for Ornamental purposes, as *Ganitrus* Beads, the Ivory Nut, the Doom Palm, *Coquilla* Nuts, Bottle Gourds, &c.*
- J. *ANIMAL.*
 - 1. *Wool, Hair, Bristles, Whalebones.*
 - 2. *Silk from the Silk-worm *Bombyx Mori*, and from other species in India, e.g. *Bombycilla Cynthia* and *Attacus Paphia*.*
 - 3. *Feather, Down, Fur, Skins.*
 - 4. *Miscellaneous.*

K. FOR DOMESTIC OR ORNAMENTAL PURPOSES, OR FOR THE MANUFACTURE OF IMPLEMENTS.

1. Bone, Horn, Hoofs, Ivory, Tortoiseshell, Shagreen, Quills.
2. Pearls, Seed Pearl, Mother-of-pearl, Coral, and Shells generally.
3. Oils, Tallow, Spermaceti, Wax, Lard.
4. Miscellaneous, as Sponge, Goldbeater's-skin, Catgut, Silkworm-gut, Bladders, &c.

L. AS AGENTS IN THE MANUFACTURE OF VARIOUS ARTICLES.

1. Glue, Isinglass, Gelatine, Bone-black, Ivory-black, Animal Charcoal.

M. FOR THE PRODUCTION OF CHEMICAL SUBSTANCES.

Blood, Bones, Horns, &c., for the production of Phosphorus, the Prussiates, the Superphosphates, &c.

N. FOR PIGMENTS AND DYES.

1. Cochineal and Carmine.
2. Dyes from the Galls of the Aphides.
3. Gall-stone, pigment from Ox-gall.
4. Indian dyes from the Coccus, the various kinds of Lacs.
5. Miscellaneous, as Sepia, Enena d'Orient, &c.

M A C H I N E R Y.

V. Machines for direct use, including Carriages and Railway and Naval Mechanism.

A. STEAM ENGINES AND BOILERS, WATER AND WIND MILLS, AND VARIOUS OTHER PRIME MOVERS.

1. Boilers.
2. Land Engines.
3. Marine Engines.
4. Windmills.
5. Water-wheels and Turbines.
6. Water-pressure Engines, as Richenback's and Armstrong's.
7. Vacuum Power Engines.
8. Electro-Magnetic Engines, &c.
9. Miscellaneous.

B. SEPARATE PARTS OF MACHINES, SPECIMENS OF WORKMANSHIP. (See also WATER AND GAS WORKS in VII.)

1. As heavy Castings or Forgings in the rough; Castings or Forgings, plain, intricate, or beautiful, in the Rough.
2. Specimens of Turning in Metals.
3. Specimens in filing and finished Work in Metals, such as Surfaces, Irregular Figures, &c.
4. Valves, Cocks, Pistons, Governors, &c.

C. PNEUMATIC MACHINES.

1. Air Pumps.
2. Blowing Fans.
3. Blast Engines for Furnaces, &c.
4. Miscellaneous.

D. HYDRAULIC MACHINES, CRANES, ETC., PILE DRIVERS, ETC. (See also VII.)

1. Hydraulic Machines—
Pumps and Fire Engines.
Water Rams.
Hydraulic Presses, &c.
Water-meters, &c.
2. Cranes—
Any sort of Crane motion and contrivances, Jacks of all sorts. (For Windlasses, Capstans, and Blocks, see VIII. E.)
3. Piling Engines.—(See also VII. A.)
By hand power, or steam.
Pile Sawing Machines.
Pile Extractors, &c.

E. LOCOMOTIVES AND RAILWAY CARRIAGES, &c.

1. Railway Locomotives.
2. Common Road Locomotives.
3. Railway Carriages, Trucks, and Waggons.
4. Railway Velocipedes, &c., &c., of all sorts.
5. Atmospheric Railway Apparatus.
6. Carriage Breaks.
7. Buffers, Couplings, &c.

F. RAILWAY MACHINERY AND PERMANENT WAY.

1. Permanent Way complete.
2. Sleepers.
3. Chairs, &c.

4. Rails.

5. Switches.
6. Turntables.
7. Station Arrangements.
8. Signals.
9. Miscellaneous.

G. WEIGHING, MEASURING, AND REGISTERING MACHINES FOR COMMERCIAL AND NOT FOR PHILOSOPHICAL PURPOSES.

1. Commercial Weighing Instruments.
2. Instruments of Measure.
3. Registering Instruments, Gauges, Indicators, and Telltales.

V. a. Carriages generally—not including those connected with Rail or Tram Roads.

A. FOR TOWN USE.

Dress Vis-à-Vis.	Landaulet.
Dress Coach.	Step-piece Landau.
Dress Chariot.	Barouche.
Landau.	Sociable.

B. TRAVELLING CARRIAGES.

Coach.	Britska.
Driving Coach.	Droitska.
Chariot.	Fourgon.
Britska Chariot.	Invalid Carriage.
Dormeuse Post Chariot	Sledges, &c.
Post Chariot.	

C. FOR GENERAL USE.

Basterna.	Curricles.
Brougham.	Cabriolet.
Double Brougham.	Headed Chaise.
Clarence.	Tilbury.
Pilentum.	Stanhope.
Cariole.	Dennett.
Domestic.	Gig.
Driving Phaeton.	Irish Car.
Mail Phaeton.	Dog Cart.
Cabriolet Phaeton.	Pony Chaise.
Park Phaeton.	Invalid Bath Chair.
Pony Phaeton.	Velocipedes.

D. PUBLIC CARRIAGES.

Mail Coach.	Hansom's Cab.
Stage Coach.	Street Cab.
Omnibus.	Fly.
Hackney Coach.	Hearse.
Hackney Chariot.	Caravan.
Glass Coach.	

E. CARTS AND WAGGONS OF ALL KINDS, NOT BEING AGRICULTURAL.

VI. Manufacturing Machines and Tools, or Systems of Machinery, Tools, and Implements employed for the undermentioned purposes.

A. MANUFACTURES OF ALL SPUN, WOVEN, FELTED, OR LAID FABRICS.

1. Machinery for the complete formation from the Raw Material of all Fabrics of Cotton, Wool, Flax, Hemp, Silk, Caoutchouc, Guta Percha, Hair.
2. Paper-making and Staining.
3. Printing and Bookbinding.

B. MANUFACTURES OF METALS.

1. The manufacture of Metals from the Ore into Bars, Rods, Wire, Sheets, and other general forms; also casting and polishing of Metal, &c.
2. The cutting and working of Metals by Machine Tools, such as Lathes; Machines for Planing, Drilling, Boring, Slotting, Sawing, Stamping, Shearing, Riveting, Punching.
3. Machines and Tools used by the Makers of Gold, Silver, and Plated Goods.
4. Machines and Tools used by the Makers of Cutlery, Nails, Screws, Pins, Needles, Buttons, and metallic Pens, &c.
5. Machines and Tools used by Locksmiths, Die-sinkers, &c.

- C. MANUFACTURES OF MINERAL SUBSTANCES AND MINING MACHINERY. (See also SECTION I.)
 - 1. Machines and Tools for the preparation and working of all kinds of Glass, Stone, Granite, Alabaster, Slate, Clay, &c.
 - 2. Machines and Tools used in the preparation and working of Gems, &c.
- D. MANUFACTURES OF VEGETABLE SUBSTANCES.
 - 1. Machines and Tools for the preparation and working of all kinds of Wood.
 - 2. Mills and other machinery for Grinding, Crushing, or Preparing Vegetable Products.
- E. MANUFACTURE OF ANIMAL SUBSTANCES.
 - Machinery and Tools for working in Horn, Bone, Ivory, Leather, &c.
- F. MACHINERY AND APPARATUS FOR BREWING, DISTILLING, AND MANUFACTURING CHEMISTRY.

VII. Civil Engineering, Architectural, and Building Contrivances.

- A. FOUNDATIONS AND BUILDING CONTRIVANCES CONNECTED WITH HYDRAULIC WORKS.
 - 1. Application of the Screw Pile for the Foundations of Piers, Jetties, &c., Beacons, and Ships' Moorings.
 - 2. Pneumatic Piling, Machinery illustrative of the mode of sinking and guiding the Cylinders, also Contrivances for overcoming difficulties where obstructions are offered to their sinking.
 - 3. Coffer-dams on soft and rock bottoms, and Apparatus connected with them.
 - 4. Foundations of Lighthouses exposed to the violent action of the sea.
 - 5. Diving-bells, Helmets, and Apparatus connected with them.
 - 6. Boring Tools, and Contrivances for ascertaining the stratification on Sites of intended Structures.
- B. SCAFFOLDING AND CENTERINGS.
 - 1. Scaffolding for the erection of Brick Chimney Shafts, Columns of Masonry, Towers, and Spires.
 - 2. Portable Scaffoldings, Ladders, and Fire Escapes.
 - 3. Scaffolding for the erection of Monolithic Blocks, as Obelisks, &c., and for the hoisting of great Weights.
 - 4. Fixed and Turning Scaffolding for the repairs, &c., of Domes, &c., internally and externally.
 - 5. Scaffolding and Contrivances for the erection of large Girder Bridges (as Britannia Bridge).
 - 6. Centerings for Arched Bridges, Domes, and Vaults.
 - 7. Centerings for Tunnels, Shields, and Contrivances for facilitating their excavation.
- C. BRIDGES, TUNNELS, AND ENGINEERING CONTRIVANCES FOR CROSSING RIVERS, RAVINES, &c.
 - 1. Timber Bridges.
 - 2. Cast-iron Bridges.
 - 3. Wrought-iron Bridges (Girder or Lattice).
 - 4. Turning or Swing Bridges.
 - 5. Lifting or Bascule Bridges.
 - 6. Draw and Rolling Bridges.
 - 7. Suspension Bridges.
 - 8. Temporary Bridges. (See also VIII. M.)
 - 9. Floating Bridges, as across the Hamoaze, and to receive Railway Trains, as across the Humber.
 - 10. Examples of Brick and Stone Bridges.
- D. DOCK, HARBOUR, RIVER, AND CANAL WORKS.
 - 1. Docks and Slips for the building and repair of Ships.
 - 2. Mercantile Docks, and Arrangements connected therewith, for the loading and unloading of Ships.
 - 3. Sea and Canal Locks, Gates and Entrances, Stop-gates, Sluices, &c.
 - 4. Marine Railway Slips and Hydraulic Docks.
 - 5. Harbours of Refuge.
 - 6. Breakwaters, Piers, Jetties, Wharfs, and Landing-piers.
 - 7. Groynes, Sea-defences, &c.
 - 8. Perpendicular Lifts for Canals, and other Engineering Contrivances instead of Locks.
- 9. Dredging-machines, Hedgehogs, and other Machines employed in Harbour Works, for removing Shoals, &c.
- E. LIGHTHOUSES AND BEACONS.
- F. ROOFS, BUILDINGS, AND CONTRIVANCES FOR COVERING LARGE AREAS.
 - 1. Examples of Timber and Iron Trusses.
 - 2. Roofs for Markets, Railway Stations, &c.
 - 3. Roofs for Theatres.
 - 4. Fire-proof Buildings, arranged so as to be applicable to the economical methods of construction.
 - 5. Coverings for Roofs.
- G. WATER-WORKS, AND THE ENGINEERING CONTRIVANCES CONNECTED WITH THE OBTAINING, STORING, AND DISTRIBUTION OF WATER IN TOWNS.
 - 1. Well-sinking and Boring, and the Apparatus connected therewith.
 - 2. Storing, Filtering, and Distributing Reservoirs, and the Contrivances connected with them.
 - 3. Contrivances for maintaining and producing efficient Heads, and the Apparatus connected with Street Mains.
 - 4. Services, and Apparatus connected with Domestic Water Supply. (See also V., B.)
- H. GAS-WORKS, AND CONTRIVANCES CONNECTED WITH THE ECONOMICAL PRODUCTION OF ARTIFICIAL LIGHT.
 - 1. Retorts and Distillatory Apparatus.
 - 2. Condensing, Separating, and Purifying Apparatus.
 - 3. Governors and Station Meters.
 - 4. Gauges, Valves, and contrivances connected with the Mains for the Distribution of Gas. (See also XXII.)
- I. SEWERAGE, CLEANSING, PAVING, AND THE CONTRIVANCES CONNECTED WITH THE SANITARY CONDITION OF TOWNS.
 - 1. Forms of Sewers, their Entrances and Junctions.
 - 2. Contrivances for Cleansing, Flushing, and Ventilating Sewers.
 - 3. Contrivances for removing and distributing Sewage.
 - 4. Traps, and other means of preventing emanations. (See also XXII.)
 - 5. House Drains, and the Internal Sanitary arrangements of Houses. (See also XXII.)
 - 6. Pavements.
- J. WARMING AND VENTILATING DOMESTIC RESIDENCES, AND THE CONTRIVANCES CONNECTED THEREWITH.
 - 1. Arrangements for Warming, as with Hot Air, Water, Steam, &c.
 - 2. Contrivances for preventing Smoke, and Chimney-sweeping Machines.
 - 3. Contrivances for Ventilation on a large Scale.
- K. MISCELLANEOUS.

VIII. Naval Architecture, Military Engineering; Ordnance, Armour, and Accoutrements.

- A. ILLUSTRATIONS BY MODELS OF SHIPBUILDING FOR PURPOSES OF COMMERCE.
 - 1. Ships.
 - 2. Barks.
 - 3. Brigs and Brigantines.
 - 4. Snows and Ketches.
 - 5. Schooners.
 - 6. Sloops and Cutters.
 - 7. Luggers, Barges, &c.
- B. ILLUSTRATIONS BY MODELS OF SHIPBUILDING FOR PURPOSES OF WAR.
 - 1. Ships of the Line.
 - 2. Frigates.
 - 3. Sloops, Corvettes, and Brigs.
 - 4. Cutters, Brigantines, Ketches, Schooners, Barges, &c.
 - 5. Bomb or Mortar Vessels, Fire-ships, Gun-boats, &c.
- C. ILLUSTRATIONS BY MODELS OF SHIPBUILDING FOR THE APPLICATION OF STEAM OR OTHER POWERS.
 - 1. Great War Steamers.
 - 2. Steam-vessels of large burden for long Passages.
 - 3. Steam-vessels for Inland, River, or Lake Navigation.
 - 4. Sailing-vessels fitted for the temporary appliance of Steam or Human Power.
 - 5. Miscellaneous.

D. VESSELS USED FOR AMUSEMENT, AND SMALL VESSELS GENERALLY.

1. Seagoing Yachts of all kinds.
2. River Yachts, and Pleasure Boats of a smaller class.
3. Rowing Boats of all kinds.
4. Fishing Boats and Vessels.
5. Life Boats and Paddle-box Boats.

E. RIGGING, ANCHORS, WINDLASSES, CAPSTANS, SHEATHING, AND ARTICLES CONNECTED WITH PRACTICAL SEAMANSHIP AND THE SAVING OF LIFE FROM SHIPWRECK.

F. INFANTRY ARMY-CLOTHING AND ACCOUTREMENTS.

G. CAVALRY ARMY-CLOTHING AND ACCOUTREMENTS.

H. CAMP EQUIPAGE, SUCH AS MARQUEES, TENTS, &c.

I. NAVAL GUNNERY, AND WEAPONS OF ATTACK AND DEFENCE MORE ESPECIALLY ADAPTED TO NAVAL PURPOSES.

J. ARTILLERY EQUIPMENTS, BOTH IN GARRISON AND THE FIELD, MACHINES FOR MOUNTING AND DISMOUNTING ORDNANCE.

1. Garrison Equipments.
2. Field Equipments.
3. Machinery for Mounting and Dismounting and transporting Ordnance, Carriages, &c.

K. ORDNANCE AND PROJECTILES.

1. Guns.
2. Howitzers.
3. Mortars.
4. Shots, Shells, and other Projectiles.

L. SMALL ARMS.

1. Rifles.
2. Muskets.
3. Carbines.
4. Pistols.
5. Lances.
6. Swords.
7. Bayonets.
8. Cartridges.

M. MILITARY ENGINEERING, FIELD EQUIPMENTS, METHODS OF PASSING RIVERS AND OTHER OBSTACLES, THE ATTACK AND DEFENCE OF FORTRESSES, AND FIELD FORTIFICATION.

1. Field Engineer Equipments.
2. Military Bridges, Pontoons, Rafts, Boats, &c.
3. Field Fortification and Materials used in the attack and defence of Fortresses.
4. Permanent Fortification.

IX. Agricultural and Horticultural Implements.

A. IMPLEMENTS FOR TILLAGE.

1. Ploughs, including Subsoil Ploughs and Pulverisers.
2. Harrows.
3. Sacrifiers, Cultivators, and Grubbers.
4. Clod Crushers and Norwegian Harrows.
5. Rollers.
6. Digging and Trenching Machines.

B. DRILLING, SOWING, MANURING, AND HOEING MACHINES.

1. Pressers.
2. Drills.
3. Dibblers.
4. Horse Hoes.
5. Broadcast Sowing Machines.
6. Contrivances connected with the distribution of Manure.

C. HARVESTING MACHINES.

1. Machines for cutting Corn or Grass.
2. Tedding Machines for Hay.
3. Rakes for Hay, Corn, Stubble, &c.

D. BARN MACHINERY.

1. Steam Engines, and Water-power Machines.
2. Horse Works.
3. Thrashing Machines.
4. Straw Shakers.
5. Winnowing, Corn Cleaning, and Barley Hummelling.
6. Crushing and Splitting Mills.
7. Flour and Meal Mills.
8. Chaff Cutters.
9. Corn Weighing and Meters.
10. Gorse Bruisers and Cutters.
11. Chicory Cutters.
12. Cider Presses.

E. FIELD, FOLD, AND YARD MACHINERY.

1. Turnip-cutters.
2. Root Grating and Squeezing Machines.
3. Potato-washers.
4. Steaming Apparatus.
5. Feeding Apparatus.
6. Weighing Machines for Cattle, &c. (See G.V.)
7. Watering Engines, for Fire or Garden Purposes. (See D. V.)
8. Contrivances connected with the Stack-yard and Storing.
9. Contrivances for Fencing, Folding, &c.
10. Fittings for Stables, Cow-houses, &c.

F. AGRICULTURAL CARRIAGES, HARNESS, AND GEAR.

1. Waggons, Carts, &c.
2. Brakes.
3. Separate parts, as Wheels, Axles, &c.
4. Harness and Gear.

G. DRAINAGE IMPLEMENTS.

1. Machines for making Pipes, Tiles, and Bricks.
2. Implements for Draining, and Tools.
3. Tiles, Pipes, and other Materials used in Draining.
4. Scoop Wheels and other Machines used in Draining or Lifting Water.
5. Machines and Contrivances for Irrigating Lands.
6. Sluices, Draw Gates, &c.

H. DAIRY IMPLEMENTS.

1. Churns.
2. Cheese-presses.
3. Miscellaneous Contrivances used in the Dairy.

I. MISCELLANEOUS IMPLEMENTS USED IN AGRICULTURE.

1. Rick Ventilator.
2. Ladders.
3. Pitch and Tar Melters.
4. Sheep-dipping Apparatus.
5. Farm Railway.
6. Models of Farm Buildings.
7. Alarm Gun for Protecting Crops.
8. Beehives.
9. Instruments for Cattle, Probangs, &c.
10. Tree Remover.
11. Various Miscellaneous Articles.

J. GARDEN ENGINES AND TOOLS.

X. Philosophical Instruments, and Processes depending upon their use: Musical, Horological, and Surgical Instruments.

A. INSTRUMENTS FOR THE MEASUREMENT OF SPACE.

1. In fixed observatories, as Transits, Transit Circles, great Quadrants, Mural Circles, Zenith Sectors, Altarimeters, Equatorials, Collimators, &c.
2. For Nautical Astronomy and Observations, as Sextants, Reflecting and Repeating Circles, Dip Sectors, &c.
3. Astronomical and Topographical Illustrations, as Globes, Orreries, Planetariums, Maps, Charts, &c.
4. Optical Instruments, as great Refracting and Reflecting Telescopes, with their appurtenances, equatorial motions, &c.
5. Apparatus subordinate to Graduated Instruments, as divided Object Glasses and Helometers, Eye-pieces, Micrometers, Micrometer Microscopes, &c.
6. Survey Instruments.
 - Topographical, as Base Apparatus, Theodolites, Repeating Circles, Geodetic Signals, Levelling Apparatus, Miners' and Prismatic Compasses, Pocket Sextants, Perambulators, Pedometers.
 - Hydrographical, as Sounding Machines, Patent Logs, Current Meters, Silometers.

A. INSTRUMENTS TO MEASURE THE EFFECTS OF MECHANICAL AND PHYSICAL FORCES.

1. Mechanical, as Dynamometers, Tachymeters.
2. Mass (Weighing Instruments), as Weighing Machines, Scales, Chemical and Assay Balances.
3. Density, as Areometers and other Instruments to determine Specific Gravity, Invariable Pendulums, Atwood's Machine.
4. To measure other Physical Effects, including Meteorological Instruments, as Barometers, Hydrometers, Eudiometers, Thermometers, Pyrometers, Electrometers, Rheometers, Magnetometers, &c.

C. INSTRUMENTS TO ILLUSTRATE THE LAWS OF MECHANICAL AND PHYSICAL SCIENCE.

1. "Kinematics,"—Instruments to exhibit and describe Motions and their Combinations, as Compasses, Pentagraphs, Instruments for describing Elliptical and other Figures, &c.
2. Mechanics, or Instruments to illustrate the Laws of Static and Dynamic Forces.
 - a. Stereo-Mechanics, as for illustrating Mechanical Powers, accelerated and retarded Motion, Equilibrium and Parallelogram of Forces, Levers, Cathetometers, Centripetal and Centrifugal Forces, Elasticity, &c.
 - b. Hydro-Mechanics, as Instruments to illustrate the Motion and Impinging Force of Waves, &c.
 - c. Pneumo-Mechanics, as Apparatus connected with the Air-Pump, &c.
3. Instruments to illustrate the Laws of Corpuscular Forces, as Whitworth's Planes, Endosmometers, &c.
4. Instruments to illustrate the Laws of Sound.
5. " " " Light.
6. " " " Heat.
7. " " " Electricity, including Voltaic and Thermo-Electricity, Magnetism, Electro-Magnetism, Magnetic Electricity, Dia-Magnetism, &c.

D. APPLICATION OF MECHANICAL AND PHYSICAL SCIENCE TO USEFUL PURPOSES, NOT INCLUDED IN ANY OF THE PRECEDING OR SUBSEQUENT SECTIONS.

1. Mechanics.
 - a. Stereo-Mechanics, when not included in Sections describing their more extended uses.
 - b. Hydro-Mechanics,
 - c. Pneumo-Mechanics, as Air Pumps, Rarefying and Condensing, Diving Bells, Air Balloons, &c.
2. Sound (not including Musical Instruments).
 - a. Instruments to assist Hearing.
 - b. Alarms, Bells.
 - c. Models of Acoustical Buildings, &c.
3. Light—Instruments to assist Vision, as smaller Telescopes, Opera Glasses, Spectacles, Microscopes, Lenses, Mirrors, Signals, Visual Telegraphs, Light-houses, Optical Illusions, Gas and Solar Microscopes, Cameras, Photography, Polarization of Light, &c.
4. Heat—Apparatus for producing Heat, for Freezing, Thermostats, Burning Lenses, and Mirrors, &c.
5. Magnetism and Electricity—Mariner's Compasses, Electric and Electro-Magnetic Telegraphs, Electric Light, applications of Electro-Magnetism as a Motive Power, Therapeutic applications of Electricity, Electrotype Apparatus and Specimens, &c.

E. CHEMICAL AND PHARMACEUTICAL APPARATUS.

F. MISCELLANEOUS.

X. a. Musical Instruments, &c.

A. WIND INSTRUMENTS.

1. Wood—	2. Metal—
Flutes (also in Metal, &c.)	French Horns.
Flageolets.	Trumpets.
Oboes.	Bugle Horns.
Clarinets.	Cornets à Pistons.
Bassoons.	Cornopeans.
Serpents.	Trombones.
	Ophicleides.

B. STRINGED INSTRUMENTS.

Harps.	Violas.
Guitars.	Violoncellos.
Violins.	Double Basses.

C. KEYED INSTRUMENTS WITH FIXED TONES.

Organs.	Harmoniums.
Pianofortes.	Concertinas.
Seraphines.	Accordions.

D. INSTRUMENTS OF PERCUSSION.

1. Drums—	2. Cymbals—
Bass Drums.	Triangles.
Kettle Drums.	
Side Drums.	
Tambourines.	

E. AUTOMATIC INSTRUMENTS.

Mechanical Organs.
Musical Boxes, &c.

F. MISCELLANEOUS ARTICLES IN CONNEXION WITH MUSICAL INSTRUMENTS.

Tuning Forks, Tuning Hammers, Pitch Pipes, &c.
Wire Strings, Catgut Strings, &c.

G. MUSICAL DIAGRAMS.

X. b. Horology.

A. GREAT CLOCKS FOR CHURCHES, CASTLES, STABLES, AND PUBLIC BUILDINGS IN GENERAL.

1. With 3 and 4 wheel Trains.
2. With Remontoires and with various Escapements.
3. To strike the Hours, and the Hours and Quarters.
4. The various Compensation Pendulums in use.
5. The various modes of making the Work to carry the Hands, and communicating the motion from the Clock to the Hands.
6. Electric or Magneto-electric Clocks.

B. ASTRONOMICAL CLOCKS.

1. The various Escapements employed.
2. The various Compensation Pendulums used.
3. Equation Clocks.
4. Clocks, commonly called Journeymen Clocks, for Observatories.

C. CLOCKS APPLIED IN REGISTRATION.

1. To register the Barometer daily for twelve months, or other periods.
2. To register Tides and Winds.
3. To register the punctual attendance of Watchmen and others.

D. CLOCKS SHOWING DIFFERENT PHENOMENA.

1. Cycle of the Sun and Moon, Eclipses, Moon's Age, Equation of Time, the Golden Number, Tides, &c.

E. CLOCKS FOR THE COMMON PURPOSES OF LIFE.

1. Weight Clocks.
2. Spring Clocks with Pendulums.
3. Balance Clocks of various descriptions.

F. CLOCKS AND TIME-PIECES IN DECORATED CASES, COMMONLY CALLED ORNAMENTAL CLOCKS, FOR DRAWING-ROOMS, LIBRARIES, &c.

1. In Metal Cases, Gilt and Lacquered.
2. In Buhl Cases.
3. In Wood Cases.
4. In China Cases.

G. SUNDRIES APPLICABLE TO CLOCKS.

1. The various modes by which Clocks are kept going while being wound.
2. The various Escapements employed in Clocks of different descriptions.
3. Various portions of Mechanism forming parts of, or applicable to, Clocks.

H. MARINE CHRONOMETERS.

1. Eight-day.
2. Two-day.
3. Thirty-hour.
4. The various descriptions of Compensation Balances applied to Chronometers.
5. The various descriptions of Pendulum Springs applied to Chronometers.
6. Pocket Chronometers.

I. POCKET WATCHES OF VARIOUS DESCRIPTIONS.

1. For measuring Minute Portions of Time and registering Observations.
2. With Compensation Balances.
3. Duplex Escapement.
4. " Horizontal Escapement.
5. " Lever Escapement upon different constructions.
6. " the old original Vertical Escapement.
7. Repeaters upon different constructions to strike the Hours and Quarters.
8. The same to strike the Hours, Quarters, and Half-quarters.
9. The same to strike the Hours, Quarters, and Minutes.
10. Clock-watches to strike the Hours and Quarters in a similar manner to Clocks.

11. Clock-watches, and, in addition, Repeaters.
12. Watches with Alarms.
13. Watches known by the denomination of Ladies' Watches, with the Cases decorated in various ways.
14. Various portions of Mechanism forming parts of Watches.

J. WATCHES FOR DIFFERENT MARKETS—

1. As for Turkey, with three Cases and Turkish Dials.
2. For China, with peculiar Cases and Dials.
3. For India and South America.
4. For Home Country districts.

K. MISCELLANEOUS.

X. c. Surgical Instruments.

A. FOR OPERATIONS ON THE EYE.

Special Instruments for—

1. Operation on the Eyelids.
2. Fistula Lachrymalis.
3. Strabismus.
4. Artificial Pupil.
5. Cataract.
 - By Depression.
 - By Extraction.
 - a. Including Elevators in Silver and Ivory, Fine Bistouries, Trocars, Canulas, Styles, Sounds, various Needles, &c.
 - b. Cataract Knives, Hooks, Capsular Forceps, &c.

B. OPERATION ON THE EAR.

Special Instruments for—

1. Exploration of the Aural and Eustachian Passages.
 - a. Sounds, Catheters, Speculums, &c.
2. The Conveyance of Air or Liquid into the Tympanic Cavity.
 - b. Pneumatic and other Syringes in Metal, Glass, Caoutchouc, &c.
3. The Removal of Foreign Bodies from the Meatus.
 - a. Levers, Branch Forceps, &c.
4. Perforation of, and other Operations on, the Membrana Tympani.
5. The Conduction of Sound.
 - a. Including all kinds of Acoustic Instruments and Contrivances, Ear Cornets, Speaking Trumpets, &c.

C. OPERATIONS ON THE NOSE—NASAL FOSSÆ AND ANTRUM.

Special Instruments for—

1. The Removal of Polypi.
 - a. Various Forceps, Porte-ligatures, Serre-nœuds, &c.
2. The Removal of Extraneous Substances.
3. The Arrest of Haemorrhage from the Posterior Nares.
 - a. Including all Contrivances for "Tamponnement."
4. Exploration and Injection of the Maxillary Sinus.
 - a. Including Jourdain's Sounds, Catheters, &c.
5. Perforation and Injection of the Antrum.
 - a. Including Liston's Drills, Antrum Syringes, Plugs, &c.

D. OPERATIONS OF THE MOUTH AND PHARYNX.

Special Instruments for—

1. Hare Lip.
2. Operations on the Teeth (Dental Instruments).
3. Myotomy and Ligature of the Tongue.
4. Cleft Palate and other Operations on the Roof of the Mouth (Staphyloraphic Instruments).
 - a. Including Obturators, Cleft and Notched Needles, Palate Holders, Porte-Sutures, &c.
5. Excision of the Uvula and Tonsils.
6. Cauterisation and other Operations on the Pharynx.
 - a. Tonsillar Guillotines, Pharyngotomes, &c.
7. Salivary Fistula.
 - b. Parotidean Canulas, Leaden Threads, &c.

E. OPERATIONS ON THE THORAX AND RESPIRATORY ORGANS.

Instruments for—

1. Tracheotomy and Laryngotomy.
 - a. Including Marshall Hall's Tracheotome, Sampson's Springs and Tubes, &c.

2. The Removal of Foreign Bodies from the Larynx, Trachea, and Bronchi.
3. Paracentesis Thoracis (Empyema).
4. Various Purposes.

- a. Including Inhalers for the administration of Chloroform, Ether, and other Medicinal vapours.
- b. Instruments used to restore Suspended Animation, c. Respirators in all Materials.

5. Physical Examination of the Chest.

- a. Instruments for Auscultation, Percussion, and Admeasurement of the Chest; Stethoscopes and Pleximeters in all materials; Spirometers and Stethometers, as suggested by Quain and Sibson, &c.

F. OPERATIONS ON THE ABDOMINAL WALLS AND ALIMENTARY CANAL.

Special Instruments for—

1. Stricture and other morbid states of the Oesophagus, the removal of Foreign Bodies, &c.
 - a. Including Oesophagus Bougies and Pro-bangs in elastic gum and other materials, Oesophagotomes, Gullet-forceps, &c.
2. The introduction and withdrawal of Fluids from the Stomach; the removal of Poison, &c.
 - a. The Stomach Pump and its appendages, Enema Syringes, &c.
3. The formation and maintenance of artificial Anus.
 - a. Enterotomes, Porte-Sutures, &c., by Dupuytren, Blandin, and others.
4. Prolapsus Ani.
 - a. All kinds of Rectum-Plugs, in metal, elastic gum, &c.
5. Fistula, Fissures, and Vegetations in Ano.
 - a. Fistula Knives, Directors, &c.
 - b. Porte-ligatures (on Luke's and Sampson's plan).
6. Hernia.
 - a. Cutting Instruments for its radical cure.
 - b. Trusses and all artificial means of support.
7. Paracentesis Abdominis.
8. Physical examination of the Rectum.
 - a. Various Speculums (by Hilton and others).

G. OPERATIONS ON THE GENITO-URINARY SYSTEM IN THE MALE.

Instruments for—

1. Lithotomy.
 - a. Including Lithotomes, Gorgets, Staffs, Forceps, Scoops, &c.
2. Lithotripsy.
 - a. Lithotrites, which disintegrate the Stone by Perforation.
 - Ditto ditto by Concentric Pressure.
 - Ditto ditto by Percussion.
3. Syringes and other Instruments to inject and explore the Bladder.
4. Dilators, Sliding-scoops, and Apparatus to remove Calculi impacted in the Urethra; Instruments for Lithotaxy, &c.
5. Urinary Fistula.
 - a. Including all Urethroplastic Instruments, Urethrotomes, &c., for Recto-Urethral, Penineal, and Recto-Vesical Fistulae.
6. Stricture, Prostatic and Vesical Disease, and retention of Urine.
 - a. Every variety of Catheter, Bougie, Sound, Porte-Caustique, and Urinal; Curved Trocars for Puncture of the Bladder above the Pubes, through the Rectum, &c.
7. Phymosis.
 - a. Apparatus employed by Jews. b. By the Profession.

6. Hydrocele.

7. Varicocele.

- a. Including Instruments for obliteration of the Spermatic Veins (Ricord's), as well as those for simple support; Suspensory and other Bandages; Scrotal Rings, &c.

H. OPERATIONS ON THE GENITO-URINARY SYSTEM IN THE FEMALE.

Instruments for—

1. Exploration.
 - a. Including Speculums in all Materials, Sounds, Dilators, &c.
2. Operations on the Uterus, Vagina, and Cervix Uteri.

a. Hysterotomes and Instruments for Paracentesis Uteri (Lisfranc's and Simpson's), Uterine Scissors and dressing Forceps (curved and straight), Porte-Caustiques, &c.

3. Polypus Uteri.
a. Vulcella and other Forceps, Porte-ligatures, Serre-noeuds, &c.

4. Prolapsus and Procidentia Uteri.
a. Including Pessaries, Bandages, and artificial support of all kinds.

5. Vesico-Vaginal Fistula and Recto-Vaginal Fistula.
a. Hancock's new Instruments, Urinary Receptacles, &c.

6. Obstetrical Purposes.
a. Including all Midwifery Instruments, and Contrivances to remedy Lacerated Perineum.

I. OPERATIONS ON THE EXTREMITIES.
Special Instruments for—
1. Amputations.
a. Army (portable) and Hospital Cases, &c.
2. The Adjustment of Fractures.
a. Including Splints, Inclined Planes, Pads, Slings, and Bandages, in all Materials.
3. The Reduction of Dislocations.
a. Pulleys, Rings, Staples, &c.

K. OPERATIONS ON THE OSSEOUS SYSTEM.
Special Instruments for—
1. Trepanning.
2. Resection and Exarticulation.
3. The Extraction of Sequestra, &c.

L. OPERATIONS ON THE VASCULAR SYSTEM.
Instruments for—
1. Venesection.
a. Cupping Instruments, Lancets, Leech tubes, &c.
2. The Control of Haemorrhage.
a. Tourniquets, Compressors, Torsion Forceps, &c.
3. Transfusion.
4. Aneurism.
By Ligature :—a. Aneurism Needles, Porte-ligatures, Sampson's Speculum, &c.
By Compression :—b. New Instruments, by Wyld, Bellingham, and others.
5. Naevus.
a. Needles, Porte-aiguilles, &c. (Liston's and Brodie's).
6. Varices.
a. Including Elastic Bandages, Stockings, Ancelets, &c.

M. AUTOPLASTIC AND ORTHOPÆDIC OPERATIONS.
Special Instruments for—
1. The various Taliacotian Processes.
a. Rhinoplasty.
b. Chiloplasty, &c.
2. Tenotomy and Myotomy.
a. Including long-bladed Knives for the subcutaneous division of Muscles and Tendons, &c.
3. Mechanical Compensation of Lost Parts.
a. Artificial Eyes, Noses, Ears, Chins, Palates, Teeth, Hands, Arms, Legs, &c.
4. Orthopædic Processes.
a. Including all Orthopædic Apparatus, Back and Leg Boards and Irons, Stays, Belts, Supports, Suspenders, Boots, Shoes for the cure of Bunions (Lanegan's).

N. DRESSING INSTRUMENTS.
a. Surgeons' Pocket Cases and their usual contents; Spring Bistouries, Tenaculums, Scalpels, Scissors, Forceps, Spatulas, Probes and Directors, Needles, Ligature-Silks, &c.

O. MISCELLANEOUS PHILOSOPHICAL APPARATUS APPLIED TO THE INVESTIGATION AND TREATMENT OF DISEASE.
a. Microscopes, Engiscopes, and Lenses; Urinometers and Thermometers; Volta-electric Apparatus; various illuminating Speculums; Instruments in India Rubber for the application of Intense Cold; Hooper's Water Cushions for the reception of fluids of any temperature; Spongio-piline, Patent Lint, Plasters, Collodion, Nipple Shields, Breast-pumps, &c.

P. SURGICAL TABLES, BEDS, MATTRESSES, CHAIRS, CRADLES, RESTS, &c.

Q. POST MORTEM AND DISSECTING INSTRUMENTS, AND INSTRUMENTS FOR EMBALMMENT.

R. INSTRUMENTS APPLIED TO VETERINARY PURPOSES.

M A N U F A C T U R E S.

XI. Cotton.

A. COTTON YARN AND THREAD.
1. Grey Twist in Hanks and Bobbins, from No. 20 to 600.
White and Bleached Yarn.
Dyed Yarn, assorted Colours.
Turkey-red and Pink.

2. Cotton Thread.—
Two-fold Lace; 2, 3, 4, 6, and 9-cord sewing.
Two-fold Lisle; knittings.
Crochet Cottons.
Wire Thread.

3. Crapé Yarn—
Bleached.
Coloured.

B. CALICOES.
Sheetings (Grey and Bleached)—
 $\frac{1}{2}$ and $\frac{3}{4}$ Super.
Shirtings (Grey and Bleached).
Domestics.
Madapollams—
 $\frac{1}{2}$ and $\frac{3}{4}$, and 40-inch Printers'.
Long-cloths (Plain and Twilled)—
Imitation Irish.

C. CORDS AND BEAVERTEENS.
1. $\frac{1}{2}$ ell and $\frac{3}{4}$ Cords.
Genoa.
Beaver-tees.

2. Drab-betts.
Twilletts.
Fancy Drills.
Grey Twills.
Swansdowns.
Jeans.
Ticks.

3. Velvets and Velveteens.

D. MUSLINS, &c.
1. Cambrie and Jaconnet—
Mulls and Books.
Bishop and Victoria Lawns, &c.
Jaconnet, Organdies, Lenos, and Fancy Checks for Printing (Grey and Bleached).

2. Figured Muslins—
Lappets, Lenos, and Netts, White and Dyed.
Jacquard-made Goods.
Lappets, Japan Spots and Honeycombs.
" Striped and Corded.
" Allover and Diagonal Spider.
" Bengal Scarf Spot, assorted.
Harness, assorted.
Garments.
Window Curtains.
" Spot.
Book Jaconnet and Dacca Lappets.
Lenos, Plain.
" Figured.
Small Stripe and Check Doriahs.
Mexican Lappets, Coloured and White.
Turkey Gauze, White and Dyed.

3. Shawls, Handkerchiefs, and Dresses—
Imitation Cambrie Handkerchiefs, Plain and Embroidered.
Lappet Shawls.
Book Muslin Dresses, Checks.
Tapes and Cords.
Book Handkerchiefs.
Specimens of Madapollams.
Bleached Goods of various Finishes.
" Cambrie Finish.
" Jaconnet Finish.
Book Muslins, Hard, Elastic, and London Finish.
" richly Ornamented.

E. DIMITIES, &c.

1. Furniture Dimities, Plain and Figured—
Hair, Cord, and India, Plain and Figured.
Quiting.
Satteen and Twilled Jean.
2. Marseilles and Summer Quilts—
Counterpanes (White and Coloured).
Toilet Covers (Plain and Coloured).
Anti-Macassars.
Grey Sheets.
Window Hollands.
Cotton Diapers and Damasks.

F. COLOURED WOVEN COTTON.

1. Handkerchiefs for the Pocket, Head, Neck, and Shoulders—
Imitation Madras and Pulicat.
Java and Manilla
" Fancy White Grounds, Checks.
Imitation Manilla Pine-Apple Cloth.
" White Cambric.
Cravats, assorted " colours.
Figured Borders.
2. Ginghams.
Common Light Grounds, assorted, Plain.
Dark Grounds, assorted, Plain.
Earlston Ginghams.
Power-loom Seersuckers and Checks.
Turkey-red grounds.
Blue and Black heavy Checks.
Muslin Ground, Stripes and Checks.
Furniture, Stripes and Checks.
Coloured Diapers.
Crossover Stripes.
Jean Stripes.
Derries.
Hungarians.
Umbrella Ginghams.
3. Dresses, Scarfs, &c.
Java Bugis, and Manilla Sarongs.
" Chindies and Scarfs.
4. Zebras—
Blue and White Striped Dresses.
Orange-pine " "
Blue-pine. " "
Robe de Chambre.

G. OILED CALICOES OR CAMBRICS FOR PACKING.

XII. *Woollen and Worsted.*

A. BROAD CLOTHS.

1. Single Milled, 52 to 63 inches wide.
Wool-dyed Woaded Colours—
Blue.
Black.
Medleys.
Oxford and other Mixtures.
N.B. The term "Medleys" includes all
Wool-dyed Colours, excepting all
Blue and Black.
Wool-dyed, common colour, unwoaded.
Black.
Medleys.
Oxford and other Mixtures.
Drab.
Piece-dyed, Woaded Colours—
Black.
Blue.
Fancy Colours.
2. Piece-dyed, unwoaded.
Black.
Scarlet.
Gentian.
Other Fancy Colours.

A. BROAD CLOTHS—

2. Double Milled, 52 to 57 inches wide.
Subdivided same as No. 1.
3. Medium-Cloths, 54 to 63 inches wide.
Subdivided same as No. 1.
4. Ladies'-Cloths, 54 to 63 inches wide.
Subdivided same as No. 1.
5. Venetians, 54 to 58 inches wide.
Subdivided same as No. 1.
6. Army-cloth, 52 to 54 inches wide.
Subdivided same as No. 1.

7. BEAVERS.

- Subdivided same as No. 1.
- 8. PILOTS.
Subdivided same as No. 1.
- 9. MOHAIR, 54 to 58 inches wide.
Subdivided same as No. 1.
- 10. CLOAKINGS, 54 to 58 inches wide.
Subdivided same as No. 1.
- 11. TWEEDS—
Single milled.
Double milled.
Treble milled.
- 12. CHINA STRIPE CLOTHS, list, piece dyed, and other Cloths,
60 inches wide.
- 13. INDIA CLOTHS, piece dyed, 60 inches wide.
- 14. BILLIARD CLOTHS, piece dyed, 72 to 81 inches wide.
- 15. ELASTIC GLOVE CLOTH, 54 to 70 inches wide.
Subdivided same as No. 1.
- 16. UNION CLOTHS, COTTON WARPS, piece dyed, 52 to 54
inches wide.
- 17. DOUBLE COLOURS, piece dyed, 54 to 63 inches wide.

B. NARROW CLOTHS.

1. CASSIMERE double milled, 27 to 29 inches wide.
Subdivided same as Broad Cloths, No. 1.
2. CASSIMERE, single milled, 27 to 29 inches wide.
Subdivided same as No. 1.
3. DOE-SKINS, treble milled, 27 to 29 inches wide.
Subdivided same as No. 1.
4. DOE-SKINS, double milled, 27 to 29 inches wide.
Subdivided same as No. 1.
5. DOE-SKINS, single milled, 27 to 29 inches wide.
Subdivided same as No. 1.
6. CASHMERMETTES, 27 to 29 inches wide.
All Colours.
7. TWEEDS, WOOL dyed, 27 to 29 inches wide.
Double milled.
Single milled.
8. FANCY TROWSERINGS.

C. FLANNEL.

1. SAXONY FLANNEL.
White.
Coloured.
2. VARIOUS FLANNELS.
Lancashire.
Real Welsh.
Imitation Welsh.
Bath Coating.

D. BLANKETS.

1. CLOTH BLANKETS.
2. SUPERFINE BLANKETS.
3. MEDIUM BLANKETS.
4. ORDINARY BLANKETS.

E. WOOLLEN CLOAKING.

1. PLAIN.
2. MIXTURES.
3. FANCY.

F. SERGES.

Long Ells, White and Coloured.

G. TARTANS.

1. PLAIN.
2. FANCY.

H. WORSTED STUFF GOODS.

1. FABRICS composed entirely of WOOL.
Merinos.
Shalloons, Says, Serges, and Plainbacks.
Calimancos, Plain and Figured.
Lastings, Princettas, Serges de Berry.
Coatings.
De Laines.
Alepinas.
Durants and Buntings.
Moreens.
Damasks.
Damask Aprons, Damask Table Covers, &c.
Russels.
Camlets.
2. FABRICS composed of WOOL and COTTON.
Cobourg and Paramatta Cloths.
Union Double Twills.
Plain Orleans Cloths, Single and Double Warps.
Plain Muslin de Laines, Barèges, &c.
Shawl Cloths.

Union Coatings.
 " Lastings, Princettas, and Serges de Berry.
 Stockinetts.
 Fancy Lastings.
 " Worsted and Cotton Goods.
 Figured Cobourgs, Orleans, &c.
 Aprons, plain and figured.
 Linings, plain and figured.
 Union Damasks.
 " Damask Table Covers, &c.
 3. Fabrics composed of Wool and Silk.
 Silk-warp Cobourgs and Orleans.
 " Double Twills.
 " Coatings.
 " Russels.
 Silk-weft Lastings.
 Silk-warp Damasks.
 4. Fancy Goods composed of Wool, Silk, and Cotton.
 5. Fabrics composed of Alpaca and Mohair mixed with Cotton or Silk.
 Plain Alpaca Lustres.
 Mixtures.
 Twilled Alpaca Mixtures.
 Plain Mohair Lustres.
 Silk-warp Alpaca Lustres.
 Alpaca and Mohair Linings.
 " Mohair, and Silk Fancy Goods.
 " Umbrella and Parasol Cloth.

I. WOOLLEN, WORSTED, ALPACA, AND MOHAIR YARNS.

XIII. *Silk and Velvet.*

A. SILK YARNS.
 1. Spun Silks.
 2. Thrown Silks.
 3. Sewing Silks.

B. PLAIN SILKS.
 1. Gros, Sarsnets, Persians, Satinets, Armures, and other plain Silks.
 2. Satins, black or coloured.
 3. Armozines, Barattees, and Serges.
 4. Serges and Lutestrings, for Parasols and Umbrellas.
 5. Brussels, Ducas, Satin, and other plain Cravats for Men's wear.
 6. Satin twilled and other plain Handkerchiefs for Ladies' wear.
 7. Bandanas, Corahs, and other Cloth for Printing.
 8. Spun Silk Handkerchiefs (for printing.)

C. FANCY SILKS.
 1. Shot, striped, checked, watered (moiré), shaded, clouded (chiné), or striped with satin.
 2. Floret, Damask, Tobine, Brocade, and other Figured Silks.
 3. Figured Vestings, Cravats, and Scarfs.
 4. Figured Handkerchiefs, Scarfs, Aprons, and Veils, for Ladies' wear.
 5. Parasol and Umbrella Silks figured, or with figured borders.
 6. Furniture Damasks and Brocades.
 7. Gold and Silver Tissues, figured and plain.
 8. Figured Pocket Handkerchiefs for Gentlemen's wear.

D. VELVETS.
 1. Plain Velvets, black and coloured.
 2. Plain Terry.
 3. Figured and Embossed Velvets.
 4. Plush (Ladies', &c.)
 5. Hat Plush.

E. GAUZES AND CRAPES.
 1. Lisse, Areophane, and other Gauzes.
 2. Plain and coloured Crapes.
 3. Figured Gauze (Blonde, &c.).
 4. Fancy Gauze or Crape Handkerchiefs.

F. PLAIN RIBBONS.
 1. Sarsnet and Lutestring Ribbon.
 2. Satin Ribbons.
 3. Gauze Ribbons.
 4. Velvet Bands or Bindings.

G. FANCY RIBBONS.
 1. Shot, striped, checked, shaded, clouded (chiné), or striped with satin.
 2. Figured or Brocaded.
 3. Gauze or Crape, with brocaded or cut figures.
 4. Embossed Satin.
 5. Figured or checked Velvet.

XIV. *Manufactures from Flax and Hemp.*

A. FLAX FIBRE.
 1. Steeped, scutched Flax Fibre, both systems.
 2. Unsteeped Flax Fibre from dried Straw.
 3. Hackled Flax from both systems, and Hackled Tow.
 4. Tow from both systems, and from the unsteeped process.
 5. Tow in the forms to mix with Wool.
 6. Flax, Hemp, &c., prepared as a substitute for Cotton and Silk.

B. LINEN YARN AND THREAD.
 1. Linen Yarn, Thread, &c.: English, Scotch, and Irish (Tow and Linen Yarn, 1/4 to 400 lea).
 2. Hand-Spun Thread as used for some fine Cambries, &c. (240 to 800 lea).
 3. Dyed Yarns and Threads of various colours.
 4. Dyed Yarns and Threads to resemble Lustre of Silk.
 5. Flax-Cotton, Flax-Fibre, Flax-Wool, and Flax-Silk Yarns.
 6. Flax Thread from unsteeped Fibre.

C. PLAIN LINENS OF ALL WIDTHS, BLEACHED, UNBLEACHED, AND DYED.
 1. Canvas—
 English, Scotch, Irish, French, Dutch, and Russian.
 2. Heavy Linens—
 As Crash, Huckabacks, Glass Cloths, and Sheetings: Yorkshire, Newark, Scotch, Drogueda, Courtrai, Ghent, Russia. Tubing for Irrigation, and Banding for Machinery.
 3. Irish Manufacture—
 Brown, Black, and coloured Linens.
 4. Platillas, Creas, Britannias, German ditto ditto.
 5. Irish Linens and Sheetings—
 Courtrai, Ghent, Bielefield, Prussian.

D. DAMASKS, DIAPERS, DRILLS, AND OTHER TWILLED LINENS: BLEACHED, UNBLEACHED, OR DYED.
 1. Damasks and Diapers—
 English, Scotch, Irish, Saxon.
 2. Drills—
 English, Scotch, Irish, French, Saxon, Russian.
 3. Linen Velveteens, Linen Velvets, and Linen Cords.

E. CAMBRICS, CAMBRIC AND LINEN HANDKERCHIEFS, PLAIN, BORDERED, EMBROIDERED, PLAIN PRINTED OR DYED; PRINTED LINENS, LAWNS, CAMBRICS, BLEACHED, UNBLEACHED, OR DYED.
 1. Irish.
 2. French.
 3. Irish, Scotch, and Swiss Embroidering (in Cambric).

F. CORDAGE OF ALL KINDS.
 Ropes, Lines, Twines, Nets, &c.

XV. *Mixed Fabrics, including Shawls; but exclusive of Worsted Goods. (Class XII.)*

A. MIXED WOVEN FABRICS.
 1. Cotton Warp, plain, watered, or figured.
 Shot with Wool or Worsted. For Dresses, Damasks, Aprons, Shoe and Boot Cloths, Linings, Cravats, Vestings, Ponchos, Pantaloons, Shawls, Scarfs, Coatings, Tweeds, Quiltings, Plaids, &c.
 " Mohair.
 " Linen.
 " Silk.
 " Silk and Worsted.
 " Silk and Cotton.
 " China Grass.
 2. Spun Silk Warp, plain, watered, or figured.
 Shot with Wool or Worsted. Dresses, Damasks, Vestings, &c.
 " Mohair.
 " Linen.
 " Net Silk.
 " Silk and Worsted.
 " All Cotton.
 3. Silk Warps, plain, watered, figured, or embossed.
 Shot with Cotton.
 " Wool or Worsted. Cabinets; Poplins; Paramattas; Chalis, Barèges; Cashmeres, &c.
 " Mohair.
 " Linen.
 " Cotton and Silk.
 " Cotton & Worsted graduated.

4. Linen Warps, plain, watered, or figured.
Shot with Wool or Worsted.
" Mohair.
" Cotton and Silk.
" Silk.

5. Cotton and Silk Warps, plain, watered, or figured.
Shot with Cotton.
" Mohair.
" Silk.
" Worsted.
" China Grass.

B. SHAWLS.

1. Woven Shawls.
Chenille, all Silk or Silk and Cotton.
Cashmere from the East.
Imitation Cashmeres, that is, Harness or Jacquard
Wove Shawls.
Plain Silk and Satin.
Figured Silk and Satin.
Crape, plain and embroidered.
Gauze, plain and figured.
Lace, plain and figured.
Shetland or knittted Woollen.
Barège, all Wool and Silk and Wool.
Grenadine and other thin texture, in Silk and Silk
and Wool.
Embroidered Lace, Silk, and Cashmere.
Woollen, plain, tartan, and fancy.

2. Printed Shawls.
Barège.
Silk, including Silk, Grenadine, and other thin mix-
tures.
Cashmere.
Chiné, or Shawls printed on the warp before they
are woven.

XVI. *Leather, including Saddlery and Harness, Skins,
Fur, Feathers, and Hair.*

A. LEATHER.

1. Rough tanned Leather—
Tanned Butts.
" Crop-hides.
" Offal, *i. e.* Shoulders and Bellies.
" Horse Butts.
" Dressing-hides.
" Horse-hides.
" Kips.
" Calf-skins.
" Seal-skins.
" Hog-skins.
" Bazils.
" Varieties.

2. Curried Leather—
Curried Calf-skin, Russet (*i. e.* Natural Colour).
" " Waxed (*i. e.* Black).
" " Butts, Russett.
" " Butts, Waxed.
" Kips, Russett.
" Kips, Waxed.
" Cordovan, Waved.
" Cordovan, Grain.
" Shoe-hides.
" Seal-skins.
" Dog-skins.
" Goat-skins.
" Boot-legs.
" Boot-fronts.
" Varieties.
" Saddlers' Hides.
" Rein-hides.
" Collar-hides.
" Chaise-hides.
" Pouch and Scabbard Hides.
" Powder Hides.
" Bellows Hides.
" Pipe Backs.
" Bag Hides.
" Pig-skins.
" Hog-skins.
" Russia Leather.

3. Enamelled Leather—
Black Enamelled Horse-hides.
" Cow-hides.
" Calf-skins.
" Seal-skins.
" Goat-skins.
" Roans.
" Skivers.
Coloured " Enamelled Calf-skins.
" Sheep-skins.
Black Japanned Horse-hides.
" Cow-hides.
" Calf-skins.
" Sheep-skins.
Coloured " Japanned Skins various.

4. Dyed Leather—
Dyed Morocco, *i. e.* (Goat-skins) for Furniture and
Coach Purposes.
" Roan, *i. e.* (Sheep-skins) for Furniture and
Coach purposes.
" Morocco, for Shoe purposes.
" Roan ditto.
" Roan ditto.
" Morocco for Bookbinding and Pocketbooks,
&c.
" Roan for Bookbinding and Pocketbooks, &c.
" Skiver ditto ditto.
" Calf ditto ditto.
Striped Seal-skin for Shoe-binding, &c.
" Cape Sheep-skins "
" Sheep " "
" Goat " "
" Horse-hide "

5. Oil Leather—
Buck-skins, finished natural colour.
Doe "
Calf "
Lambs "
Sheep "
Ox and Cow Hides "
Buck-skins, dyed or coloured.
Doe "
Calf "
Lamb "
Sheep "

6. White or Alum Leather—
Alumed Horse-hides.
" Calf-skins.
" Sheep-skins strained white.
" Lamb-skins
" Lamb-skins coloured.
" Kid-skins for Gloves, White
" Lamb-skins " Dyed.
" Sheep-skins "
" Kid-skins for Shoes.
" Calf-skins "
" Sheep-skins "
" Varieties.
Gaiter Leather.

7. Sheep and Skin Rugs—
Sheep and Lamb, Brown Rugs.
" Coloured.
" White.
Sheep Rugs for Cavalry Saddles.
Angola Goat, Coloured.
White.
Various Wild Animal Skins for Rugs.

8. Parchment and Vellum.
Sheep-skin Parchment for Deeds.
" " Bookbinding, White.
Vellum for Bookbinding, White. Coloured.
" Painting.
" Tambourines.
" Drum-heads.
" Gunpowder-sieves.

B. SADDLERY AND HARNESS.

1. Harness; Carriage, Gig, Cart.
2. Saddlery.
3. Whips.

C. MISCELLANEOUS.

1. Leather Manufactures, such as Bellows, &c.
2. Braces, Webbing-belts, &c.

D. SKINS AND FUR.

1. Sable and Martin—	Russian or Siberian Sable	As manufactured for Muffs, Tippets, Trimmings, Cuffs, &c.	14. Hare and Rabbit.
	Hudson's Bay Martin or Sable, next in repute and value		White Hair from Russia and the Polar Regions
	The North American or Canadian Baum or Wood Martin, a native of the Forests of Germany, &c.		European or Grey Hare
	Stone Martin, living in rocks, old ruined castles, buildings, &c.		Hudson's Bay and North American Rabbit
	English Martin		English Rabbit
	Dyed Sable and Martin		Flemish Rabbit
2. Otter—	Nootka Sound, or Sea Otter	As used in China for Hudson's Bay and North American Otter	Silver Grey Rabbit
		Royal robes, and by the Russians, Chinese, Greeks and Persians, for Caps, &c.	White Polish Rabbit
	European Otter		Black and Blue Rabbit
	Pull-dyed Otter		Australian Rabbit
3. Fox—	Hudson's Bay and North American Black and Silver Fox	As used abroad for Dresses, and in this country for Coat-linings, Carriage Wrappers, Ottomans, Foot-Muffs, &c.	Dyed Rabbit
	Blue Fox		
	White Fox		
	Red Fox		
	Cross Fox		
	Grey Fox		
	Kitt Fox		
	European Red Fox		
4. Bear—	Black Bear of Hudson's Bay and North America	Army Clothing and Accoutrements, and for Hearth-rugs and Sleigh coverings.	
	Brown, or Isabella		
	Grey		
	European Grey and Black Bear		
	Polar or White Bear		
5. Beaver—	Beaver from Hudson's Bay and North America	As made into Muffs, Tippets, Cuffs, and other articles of Apparel.	
	Manufactured		
	Dyed ditto		
6. Swan.	Swan Skin		
	Swansdown Skin	For Boas, Trimmings, Puffs, &c.	
	Swan Feathers		
	Swan Quills		
7. Goose.	Goose Skin	Used as Swansdown.	
	Goose Down.		
8. Mink.	North American and Hudson's Bay Mink; as used for Muffs, Tippets, Cuffs, &c.		
9. Buffalo, for Sleigh Coverings, Open Carriages, and for Railway purposes.			
10. Hudson's Bay and North American Skins.	Lynx	As used in America, when dyed, for Muffs and Tippets, and in the undyed state by the Chinese, Greeks, and Persians. The Raccoon as linings of Shakos and Coats in Russia and Germany.	
	Lynxcat		
	Dyed Lynx		
	Raccoon		
	Wolf		
	Fisher		
	Wolverin		
11. Ermine or Weasel tribe.	Ermine		
	Weasel		
	Polecat or Fitch	For general purposes of Ladies' Apparel.	
	Russian Fitch		
	Dyed Fitch		
	Kolinski and Dyed Kolinski		
	Kolrosk and Dyed Kolrosk		
12. Seal.	South Georgia, Shetland, and Falkland Isles		
	Lomar's Island and Cape		
	The Plucked and Manufactured Seal	Men's Coats and Ladies' Dresses, Muffs, Capes, Cuffs, Caps, Waistcoats, Shoes, Boots, &c.	
	Seal when dyed		
	The Greenland and Newfoundland Hair Seals		
	The Labrador Spotted and Silver Seal		
	The same in its dyed state		
13. Musquash, or large North American Rat, for Ladies' wear, as for Muffs, Boas, &c.			
	Hamster	As for Muffs, Tippets, Linings, Cuffs, &c.	
	Opossum		
	Perewiazka		
E. FEATHERS.			
1. Ostrich.	Aleppo		
	Magador	As worn in Plumes on Court occasions by Knights of various Orders, and for Military purposes, also in their application to general Dress for Ladies and for Funeral Plumes.	
	Alexandria		
	Senegal		
	Cape		
	Algoa Bay		
	Dyed		
2. Marabouts.	Marabout Stork	As Plumes for Head Dresses, Bonnets, Trimmings for Dresses, Muffs, Tippets, and Fans, and as used with Gold, Silver, or Pearls.	
	Adjutant		
	Paddy or Rice Bird		
	White		
	Grey		
	Dyed		
3. Rhea.	Long Flossy	The Feathers known by the Plumassiers as "Vulture's," and used for Ladies' wear, made up into fanciful forms, and for military purposes, in America; the common sorts made into dusting-brooms.	
	Short Flossy		
	Brown		

4. Osprey.	The Feathers of the small Egrett, as used for Ladies only. Those of the large Osprey for Ladies, and the Feathers of the back, as used for Military Plumes for the Hussar Regiments.	4. Wedding Stationery (Cards, Papers, and Envelopes).
Large		5. Mourning Stationery (Cards, Papers, and Envelopes).
Small Egrett		6. Specimens of Ornamenting, Glazing, and Packetting Writing Papers.
5. Emu	The Feathers varying in shades, as used in their natural colour for Ladies' Bonnets, and dyed darker colours and black.	7. Sealing-wax and Wafers.
6. Birds of Paradise.	The Birds, as worn by persons of rank in the East, also by Ladies in Europe and America, arranged as a Bird.	8. Pens.
The Large Emerald		9. Small Wares for Stationery.
The Small Emerald		10. Tracing Paper, made transparent by Varnishes.
The King Bird		11. Inks of all kinds.
7. Heron.	The Feathers of the head and breast of the <i>Andrea cinerea</i> , as used for Ladies, and by Knights at their installation. Those from the back of the <i>Plotus anhinga</i> , as used in England by Ladies, and in the Eastern Countries by Princes and persons of Rank.	C. PASTEBOARDS, CARDS, &c.
The Heron		1. Playing Cards.
The White-bellied Darter		2. Message Cards, plain and ornamental.
8. Ibis.	The Feathers of their natural scarlet colour, as made into Wreaths for the Head.	3. Drawing Boards.
Swan	For Ladies' Bonnets and Military Plumes.	4. Mounting Board, plain and ornamental.
Turkey	The Down of these Birds as used for Ladies' Plumes and Trimmings.	5. Pasteboard and Cardboard.
Cock	The Feathers of the neck, back, and tail made into Plumes for Ladies' and Children's Hats and Military Plumes.	D. PAPER AND SCALEBOARD BOXES, CARTONS (CARTONNERIE).
Peacocks	For Plumes and Screens.	All kinds of Boxes and Cases made of Pasteboard and Paper (not being Papier-maché), plain or ornamented.
Argus Pheasant	The Feathers marked with eyes, as used, the small for Plumes, the large for Tiaras for the head.	E. PRINTING (NOT INCLUDING FINE ART PRINTING).
Common Pheasant	Made into Trimming.	1. Type-printing generally.
Eagle	The Feathers forming the wing of this Bird as used for the Highland Bonnet.	2. Printing Inks and Varnishes.
9. Miscellaneous	The Feathers of the Jay, Duck, Grebe, and Tucan, as also several Birds from the Tropics, in their applications to Ladies' dresses.	F. BOOKBINDING, &c.
F. HAIR.		1. Binding in Cloth.
1. Hair as a substitute for Human Hair, as Wigs, Curls, Fronts, &c.		2. " Vellum.
2. Ornaments in Hair, as Plumes, Bracelets, Guards, &c. (See also XXIII. C.)		3. " Leather.
3. Hair Cloth for the purposes of Furniture.		4. " Velvet.
4. Hair for miscellaneous purposes, as for stuffing Furniture.		5. " Wood, Papier-maché, or Metal.

XVII. Paper and Stationery, Printing, and Book-binding.

A. PAPER IN THE RAW STATE AS IT LEAVES THE MILL.
1. Brown Paper and Packing Papers.
2. Millboards and Glazed Boards for pressing.
3. Printing Papers.
4. Drawing Papers.
5. Writing Papers.
6. Tissue Papers, white and tinted.
7. Papers tinted in the Pulp.
8. Tracing Papers, made so in the Pulp.
9. Papers ornamented in the Water-mark.
10. Cartridge Paper.
B. ARTICLES OF STATIONERY.
1. Envelopes, plain and ornamental.
2. Embossed and Lace Papers.
3. Printed Fancy Papers and Surface-coloured Papers, Printed and Embossed Ornaments.

XVIII. Woven, Spun, Felted, and Laid Fabrics, when shown as specimens of Printing or Dyeing.

A. PRINTING OR DYEING OF WOOLLENS, OR ANY MOUSSELINE DE SOIE, DE LAINE, OR ALPACA MIXTURE.
1. Mousseline de Laine, de Soie, &c.—
Made of all Wool.
" Cotton and Wool.
Cashmere—
Made of all Wool.
" Cotton and Wool.
Barège—
Made of Silk and Wool.
" Cotton and Wool.
" all Wool.
" Cotton, Silk, and Wool.
Balzarine, plain and figured—
Made of Cotton and Wool.
" Silk and Wool.
" Cotton, Silk, and Wool.
2. Printed or Dyed Cotton or Silk Warps, afterwards woven, known as Chiné.
3. Printed Woollen Table-covers.
4. Printed and Dyed Silks—
India Corahs in the Grey.
" dyed.
" Printed in England.
" India Bandanas (tied and dyed in India).
" Choppahs (printed in India).
British Corahs in the Grey.
" dyed.
British Twills in the Grey.
" dyed.
British Spun Silks, printed.
British Cambrics, printed.
" dyed.
British Spun Silk Dresses, dyed.
" printed.
British Corah Dresses, printed.
India Corah Dresses, printed.
Printed China Crape Shawls.

B. PRINTED CALICOES, CAMBRICS, MUSLINS, VELVET, AND VELVETEENS—

1. Cottons printed by Machines only.
 - ” by Block only.
 - ” partly by Block and Machinery.
 - Turkey-red, printed or dyed. Mules.
 - Muslins printed by Machinery.
 - ” by Block only.
 - ” partly by Block and Machinery.
 - Prints and Furniture by Machine only.
 - ” partly Block only.
 - ” partly Block and Machine.
2. Handkerchiefs for the pocket, head, neck, and shoulders.
 - Single Colours, blue ground, &c.
 - Assorted Colours, fast and loose.
 - Turkey-red, Bandanas printed.
 - ” discharged.
 - ” Chintz pattern.
 - Printed Border Handkerchiefs.
 - Imitation Cambric.
 - Fancy Muslin.
 - Imitation Java batticked Handkerchiefs.
 - Printed Aprons.
3. Printed Shawls and Dresses.
 - Shawls, assorted Colours . . . { part with fringe,
 - ” Turkey-red, or purple { part without.
 - Java Sarongs batticked.
 - Turkey-red.
 - Java Slendrongs, Turkey-red, and batticked.
 - Malay Chindey or Imitation.
 - Bombay Patolio.
 - Siam Shawls.
 - Scarfs.
 - Dresses.

B. DYED COTTON GOODS.

- Cambries and Madapolones, assorted Colours.
- ” Turkey-red.
- Imitation blue Morris and Basstas.
- Long Cloths of all kinds.
- Mull and Book Muslin of all kinds.
- Cotton Drills (blue).
- Velvet.
- Velveteens.

D. DYED LINEN GOODS.

- Printed Linens.
- Cambric Handkerchiefs.
- Lawn Shirt Fronts.
- Lawn Hankerchiefs.

E. DYEING OR PRINTING OF LEATHER, HAIR, FUR, ETC.**XIX. Tapestry, including Carpets and Floor-cloths, Lace, Embroidery, Fancy and Industrial Work.****A. TAPESTRY.**

1. Carpets of all kinds in which the Pattern is produced by Weaving or by the Hand, in the manner of Tapestry proper, including Hall Carpets, Rugs, Stair, &c.
 - a. Axminster Carpets, Flax or Jute, Chain, Woollen, or Worsted Pile, worked by hand.
 - b. Table and Chair Covers, &c., worked in the same way.
 - c. Patent Axminster Carpets, manufactured at Glasgow, made firstly as a woven Fringe, and that adapted afterwards to a thick Flax surface.
 - d. Patent Tapestry Carpet, Pattern printed in warp, any number of Colours used; Table-covers and Curtains, made in same way.
 - e. Patent Tapestry Rugs, Velvet Pile Surface, with a thick weft shoot of Cotton, Flax, or other material.
 - f. Brussels and Velvet Pile Carpet.
 - g. Tapestry Brussels Carpets, called Moquette, of a fine quality.
 - h. Kidderminster and Venetian Carpet.
 - i. Patent Mosaic Tapestry and Rugs, where the cut Wool is fixed to a ground by caoutchouc, &c.
 - j. Printed Felt Carpet, Plain and Printed Druggets, Printed and Embossed Cloth for Table-covers and Curtains.

- k. Patent Printed Carpets with Terry Pile Surface; the same Moquette for Curtains or Furniture.
- l. Cloth Embroidered by Machinery for Table-covers or Curtains.

2. Matting of Hemp, Cocoa-nut Fibre, Straw, Reeds, and Grasses, for Floor and Walls.
3. Oil-cloth for Floor or Table, whether painted or printed.
4. Woven or Embroidery, Crochet and Net Work.
5. Counterpanes and Quilts for Bed-covers; Quilting and Dimity for Bed-room Hanging.
6. Ornamental Tapestry of Silk, Wool, Linen, Mohair, Cotton, or of these Materials mingled together, or with Metal Wires, whether woven in the Loom or of any kind of Needlework, but of Patterns having so much artistic excellence as to entitle them to be exhibited in Section XXX. as Works of fine Art.

B. LACE.

1. Pillow Lace, the article or fabric being wholly made by hand (known as Valenciennes, Mechlin, Honiton, Buckingham); or guipure made by the Crochet Needle; and Silk Lace, called "Blonde" when white, and Chantilly, Puy, Grammont, and Black Buckinghamshire when black.
2. Lace, the ground being Machine-wrought, the Ornamentation made on the Pillow and afterwards applied to the Ground (known as Brussels, Honiton, or appliquée Lace.)
3. Machine-made Nets and Quillings, wholly Plain, whether Warp or Bobbin (known as Bobbin Net, Tulle, Blondes, Cambrai, Mechlin, Malines, Brussels, Alençon, &c.).
4. Lace, the Ground being wholly made by Machine; partly Ornamented by Machine and partly by Hand, or wholly Ornamented by Hand, whether Tamboured, Needle-Embroidered, or Darned.
5. Lace actually Wrought and Ornamented by Machinery; comprising Trimming Laces of every description, Veils, Falls, Scarfs, Shawls, Lappets, Curtains, &c.

C. SEwed AND TAMBOURED MUSLINS.

- Ladies' Collars, Cuffs, &c.
- Children's Robes.
- Handkerchiefs.
- Trimmings and Insertions.
- Vest Pieces.
- Shirt Fronts.
- Mantles.
- Dresses.
- Curtains, &c.

D. EMBROIDERY.

1. Gold and Silver and Glass.
2. Silk, as Shawls, Dresses, Mantles, Table Covers, and Curtains, &c.
3. Berlin Wool, Chair Covers and Fancy Articles for the Drawing-room.
4. Embroidery by Machinery.

E. FRINGES, &c.

1. Fringes, Tassels, Gymps, &c., suitable as Trimmings for Upholstery.
2. Ditto for Dresses and other fine Work.

F. FANCY AND INDUSTRIAL WORKS.

1. Berlin Wool Work.
2. Needlework.
3. Miscellaneous Industrial Works.

XX. Articles of Clothing for Immediate Personal or Domestic Use.**A. HATS, CAPS, AND BONNETS.**

1. Hats, made of Silk, Beaver, or other materials, for Men.
2. Caps, for Men.
3. Bonnets of Straw, Silk, or other material.
 - a. British Chip Bonnet made from the Poplar.
 - b. Willow Bonnet.
 - c. Brazilian Grass Hats.
 - d. Tuscan and Leghorn Plaiting and Bonnets.
 - e. Straw Plait Bonnets.
 - f. Straw Trimmings and Bonnets.
 - g. Horse-hair Trimmings and Bonnets.
 - h. Silk and other Bonnets made by Milliners.

B. HOISERY.

1. Cotton.
2. Woollen.
3. Linen.
4. Silk.

C. GLOVES.

1. Made of Leather or Skins.
2. Made of any other materials.

D. BOOTS, SHOES, AND LASTS.

1. Made of Leather.
2. Made of other materials.

E. UNDER CLOTHING.

1. For Ladies.
2. For Gentlemen.

F. UPPER CLOTHING

1. For Ladies, including all kinds of Millinery.
2. For Gentlemen, including all kinds of Tailor's-work.

XXI. Cutlery and Edge-tools.

A. CUTLERY, SUCH AS KNIVES AND FORKS, PEN AND POCKET KNIVES, RAZORS, SCISSORS, AND SHEARS.

1. Knives and Forks—
Table, Dessert, Carving.
Dessert or Fruit, with plated and silver blades.
Cake and Melon Carvers, „ „ „
Fish Knives and Forks, „ „ „
2. Spring Knives—
Pen and Pocket Knives of every description.
Hunting and Sportsmen's Knives.
3. Knives of all other descriptions—
Paper Knives of all kinds.
Desk or Office Knives.
Palette Knives.
Knives for Hunting and Self-defence, as Couteaux-de-Chasse, Bowie Knives, &c.
Knives for Kitchen and Domestic Purposes, as Cooks', Oyster, Onion, Bread and Butter, and Cheese Knives.
Knives used in various Trades, as Butchers', Shoemakers', Glaziers', Gardeners', &c.
4. Scissors and Shears—
Ladies' Work and Cutting-out Scissors of every description.
Nail, Button-hole, Barbers', and Trimming Scissors.
Shears used in various Trades, as Tailors', Brushmakers', &c.
Garden and Sheep Shears.
5. Razors of all kinds.
6. Miscellaneous—
Corkscrews, Button-hooks, Boot-hooks, Nail-nippers, Nail-files, Tweezers, &c.

B. FILES AND OTHER SMALL EDGE TOOLS, NOT INCLUDED IN MANUFACTURING TOOLS IN SECTION VI.

1. Files and Edge-tools used by Engineers, Smiths, or other Metal Workers.
2. „ for purposes of Building, by Masons, Bricklayers, and Plasterers.
3. „ for fine Metal and other work, as for Clock and Watch makers, Jewellers, Lapidaries, Engravers, and Modellers.
4. „ for Wood-work, as for Carpenters, Joiners, Cabinet-makers, Coopers, &c.
5. „ for Leather or Skins, as for Saddlers, Curriers, Shoemakers, and Bookbinders.
6. Drawing, Artists', and Engraving Instruments.
7. Files and Edge-tools for other purposes than those specified.

XXII. Iron and General Hardware.

A. BRASS MANUFACTURE.

1. Cabinet and general Brass Foundry, consisting of Hinges, Fastenings, Escutcheons, Bell-pulls, Brass-foundry used in Ships, Knockers, Door-springs, Castors, &c.
2. Plumbers' Brass Foundry, Cocks, Valves, Pumps, Water-closets, &c.
3. Stamped Brass Foundry, Cornices, Curtain-bands, Finger-plates, &c.

4. Gas-fittings, Brackets, Chandlers, Pillars, Gas Burners, and Consumers' Meters, &c.
5. Tubing, plain and ornamental.
6. Metallic Bedsteads, Brass and Iron.
7. Chandlers, Lamps, and Candelabra, for Oil, Candles, or Camphine, and Lamp Chains.
8. Railway and Carriage Brass Foundry, and Signal Lamps and Lanterns.
9. Bronze Figures, Busts, and Chimney Ornaments.
10. Bells, House, Church, Ship, Table, &c., and Alarums.
11. Candlesticks, Table and Bedroom.
12. Monumental Brasses and Ecclesiastical Brass-work.
13. Copper and Steel Plates for Engravers.
14. Miscellaneous.

B. COPPER, ZINC, TIN, PEWTER, AND GENERAL BRAZIERY.

1. Kettles, Coalscuttles, Coppers, Saucepans, Steamers, Plate-warmers, &c.
2. Bronzed Tea and Coffee Urns, Kettles, &c.
3. Tubing—Copper, Tin, Lead, &c.
4. Pewter, German Silver, and Britannia-metal Teapots, Basins, Dishes, Spoons, Ladies, Inkstands, &c.
5. Coffin Furniture—Plates, Escutcheons, &c.
6. Zinc Articles generally.

C. IRON MANUFACTURE. (See also I. and V.)

1. Stoves, Grates, Fenders and Fire Irons, Kitchen Ranges, Cooking Apparatus, Smoke-jacks.
2. Warming Apparatus, for Halls and Rooms, Ships, &c., either by Water, Coal, Coke, Wood, Charcoal, or Gas.
3. Shower, Vapour, Air, and Warm-water Baths.
4. Ventilators—Metallic and others.
5. Pipes and Gutters, &c.
6. Locks and Hinges.
7. General Ironmongery.
8. Ice Machines.
9. Knife-cleaning Machines.
10. Letter-copying Machines and Presses.
11. Saddlers' Ironmongery.
12. Hollow Ware, cast and wrought, tinned and enamelled.
13. Spades, Shovels, Pickaxes, Hoes, Rakes, Garden-rollers, &c. (See also S. IX.)
14. Nails, cut, cast, and wrought, in Iron, Copper, and other Metals.
15. Screws and Railway Bolts, &c.
16. Iron Safes, Cash-boxes, fire-proof and otherwise.
17. Horse-shoes.
18. Gates, Railings, Hurdles, and Stable Fittings.
19. Mangles, Washing Machines, &c.

D. STEEL MANUFACTURE.

1. Tools and heavy Steel Toys, Hammers, Vices, &c.
2. Steel Ornaments, and light fancy Steel Toys, Brooches, Buckles, &c.
3. Steel Pens and Metallic Pens.
4. Needles, Fish-hooks, and Fishing Tackle.

E. BUTTONS, ETC.

1. Buttons—Metallic, Florentine, Pearl, Bone, &c.
2. Metal Boxes, Watch Boxes, &c.

F. WIRE WORK, &c.

1. Wire Gauze, for Window Blinds, Fencing, Pheasantry, Birdcages, &c.
2. Wire—Iron, Brass, Steel, and Copper.
3. Pins—white and black.
4. Hooks and Eyes.
5. Metallic Wire Baskets.
6. Wire Rope.

XXIII. Working in Precious Metals and in their imitations; Jewellery, and all Articles of Virtu and Luxury not included in the other Classes.

A. COMMUNION SERVICES.

- As Altar-dishes, Flagons, Chalices, Patens, Plates, &c.

B. ARTICLES OF GOLD AND SILVER PLATE, FOR DECORATIVE PURPOSES AND PRESENTATION PIECES.

1. Racing Prizes, Testimonials, allegorical, historical, and emblematic Groups and Compositions, Shields, Centre Pieces, Vases, Tazzas, Ewers, Salvers, Candelabra, &c.
2. The same Articles made in hammered or repoussé metal.

C. SMALLER ARTICLES FOR MORE GENERAL DOMESTIC USE.

1. For the Dinner Table; as Smaller Candelabra with branches, Candlesticks, Centre Pieces, Soup and Sauce Tureens, Covered Dishes, Smaller Mounted Dishes, Flat Dishes, Flower-stands and Epergnes, Dessert Services, Table and Dessert Knives, Spoons, and Forks, Salvers, Bread and Cake Baskets, Claret Jugs, Wine Coasters, Cruet Frames, Mustard Pots, Salts, &c.
2. Breakfast and Tea-table Service; as Tea and Coffee Urns and Kettles, Tea and Coffee Pots and Stands, Sugar Basins, Milk and Cream Jugs, Ewers and Basins, Toast Racks, &c.
3. Dressing and Library Table and Travelling Utensils; as Inkstands and Writing Appendages, Dressing Cases and Instruments, &c.
4. Miscellaneous; as Watch and Clock Cases, Toys, Pencil Cases, Seals and Keys, Filagree Baskets and Ornaments.

D. ELECTRO-PLATED GOODS OF ALL DESCRIPTIONS, COMPREHENDING ALL THAT CAN BE EXECUTED IN SILVER AND OTHER METALS.

E. SHEFFIELD AND OTHER PLATED GOODS.

Centre and Side covered Dishes and Warmers, Soup Tureens, Cruet Frames, Liqueur Frames, Pickle ditto, Candlesticks and Branches, Candelabra, Bread and Cake Baskets, Snuffers and Trays, Tea and Coffee Services, Teatrays, Hand Waiters, Claret Jugs, Decanter Stands, Sugar Stands, Flower Stands, Nut Crackers, Grape Scissors, Mustard Pots, &c.

F. GILT AND OR-MOLU WORK.

1. Gilt by the Electro process.
2. Gilt by amalgamation, or "Water Gilding."
3. Imitation Jewellery and Toys.

G. JEWELLERY.

1. Works exhibiting the Precious Stones and Pearls, as Diamonds, Rubies, Sapphires, Emeralds, Opals, Turquois; and the manner of setting them in Crowns, Coronets, Stars, Orders, Tiaras, Head Ornaments, Bouquets, Necklaces, Bracelets and Armlets, Presentation Snuff Boxes, Brooches, Ear Pendants, Medallions, Studs, and Buttons.
2. Ornaments similar to those of the former class, in which are exhibited the setting of the inferior Stones, Amethysts, Topazes, Carbuncles, Aquamarines, Jacintus, Crysophrases, Carnelians, Onyxes, whether plain or set, Cameos or Intaglios, Engraved Shells, &c. &c.
3. Ornaments made of Gold, whether plain or enamelled; as Bracelets, Brooches, Necklaces, Earrings, Pins, Waist-Buckles, Chains, Buckles, Studs, Châtelaines, &c. &c. &c.
4. Jewellery by imitations of Precious and other Stones.
5. Ornaments worked in Ivory, Jet, Horn, Hair, and other materials, of which the Precious Stones or Metals do not form the principal feature.

H. ORNAMENTS AND TOYS WORKED IN IRON, STEEL, AND OTHER METALS WHICH ARE NEITHER PRECIOUS METALS NOR IMITATIONS OF THEM, AS CHATELAINES OF STEEL, CHAINS OF STEEL, SWORD-HILTS, CUT STEEL SHOE AND KNEE BUCKLES, BERLIN IRON ORNAMENTS, CHAINS, NECKLACES, BRACELETS, ETC.

I. ENAMELLING AND DAMASCENE WORK.

1. Enamelling of subjects on Gold and Precious Metals. (Except when shown in the Section of FINE ARTS.)
2. Damascene Work, or insertion of one Metal in another, not included in the above-named Classes, as forming a minor ingredient in some more important species of Manufactures.

J. ARTICLES OF USE OR CURIOSITY NOT INCLUDED IN THE PREVIOUS ENUMERATION.

XXIV. *Glass.*

A. WINDOW GLASS, INCLUDING SHEET GLASS, CROWN GLASS, AND COLOURED SHEET GLASS.

1. Crown.
2. Sheet.
3. Blown Plate Glass, silvered and unsilvered.
4. Coloured Sheet, Pot Metal, or flashed.
5. Glass Ventilators.
6. Glass Shades, round, oval, and square.

B. PAINTED AND OTHER KINDS OF ORNAMENTED WINDOW GLASS.

1. Enamelled, Embossed, Etched, painted white, or coloured Window Glass.
2. Painted and Leaded Windows.

C. CAST PLATE GLASS.

1. Rough Plate.
2. Ground and polished, silvered and unsilvered.
3. Pressed Plate.
4. Rolled Plate, white and coloured.

D. BOTTLE-GLASS.

1. Ordinary Bottle-glass, including Moulded Bottles.
2. Medicinal Bottle-glass, including Phials, &c., blown and moulded, of all kinds and shapes.
3. White Bottle-glass, Blown, Pressed, and Moulded Bottles.
4. Water-pipes and Tubing.

E. GLASS FOR CHEMICAL AND PHILOSOPHICAL APPARATUS.

1. Glass for Matras, Retorts, and other kinds of Chemical and Philosophical Apparatus.
2. Water-pipes and Tubing.

F. FLINT GLASS OR CRYSTAL, WITH OR WITHOUT LEAD, WHITE, COLOURED, AND ORNAMENTED FOR TABLE VASES, ETC.

1. Blown.
2. Moulded and Pressed.
3. Cut and Engraved.
4. Reticulated and spun with a variety of colours, incrusted, flashed, enamelled of all colours, opalescent, imitation of Alabaster, gilt, platinised, silvered, &c.
5. Glass Mosaic, Millefiori, Aventurine, and Venetian Glass Weights, &c.
6. Beads, imitation Pearls, &c.
7. Chandeliers, Candlesticks, and all Glass Apparatus for Lamps, Candlesticks, Girandoles, Wall Brackets, with or without drops, &c.

G. OPTICAL GLASS, FLINT AND CROWN.

1. Rough Discs of Flint and Crown, to make Lenses for Telescopes, Microscopes, Daguerreotype and Calotype Apparatus, &c.
2. Flint and Crown, blown or cast in plates for the Optician.
3. Thin Glass for Microscopes.
4. Refractive Apparatus, Prismatic Lenses for Light-houses. (See also Class J.)

XXV. *Ceramic Manufactures,—Porcelain, Earthenware, &c.*

A. PORCELAIN, HARD.

1. Chinese.
2. Japanese.
3. Continental, as Berlin, Meissen, &c.

B. STATUARY PORCELAIN.

1. Statuary.
2. Parian.
3. Carrara.

C. TENDER PORCELAIN.

1. English Porcelain, soft or tender.
2. French, with Silicious body.

D. STONEWARE, GLAZED AND UNGLAZED.

1. Ironstone, or Stone China, glazed.
2. White Stone body, unglazed.
3. Coloured body, Jasper.
4. " Egyptian black, unglazed.
5. " Red, " "
6. " Cane, "
7. " Drab, "
8. Brownware, with salt glaze. (The Lambeth, Chesterfield, and Beauvais manufactures are included in this class.)
9. Chemical utensils. (These are made both in Stone-ware and Hard Porcelain).

E. EARTHENWARE.

1. White body for Printing, Painting, or Enamelling in different Colours.
2. Common Cream-colour.
3. Green glazed ware.
4. Rockingham ,

5. Delft ware.
6. Majolica ware.
7. Mocha and Dipped ware.
8. Common Lead glazed ditto, for utensils.
9. Coloured body, Turquoise.
10. " Drab.
11. " Olive.
12. " Buff.
13. " Cottage brown.

F. TERRA COTTA.

1. Vases and Garden-pots.
2. Ornaments for Architecture.
3. Encaustic or Inlaid Tiles.
4. Tesseræ of various colours, compressed from powdered clay.
5. Superior Plain Tiles for Pavements, ditto ditto.
6. " Bricks, ditto, ditto.
7. " Roofing Tiles, ditto, ditto.
8. Chimney Pipes.
9. Common Bricks.
10. " Roofing Tiles, &c.

G. ORNAMENTED OR DECORATED.

1. Ornamented on *Bisque*—
Painted by hand.
Printed and transferred in various colours.
2. Ornamented on the *glaze*.
Painted by hand.
Printed by the press.
Printed by hand.
Gold Lustre.
Silver "
Steel "
Enamelling in various colours.
Gilding.

H. PRODUCTIONS FOR ARCHITECTURAL PURPOSES.

XXVI. Decoration Furniture and Upholstery, including Paper-hangings, Papier-maché, and Japanned Goods.

A. DECORATION GENERALLY, INCLUDING ECCLESIASTICAL DECORATION.

1. Ecclesiastical Decoration generally.
2. Ornamental coloured Decoration, as executed by hand.
3. Imitations of Woods, Marbles, &c., ditto.
4. Relievo Decoration, mechanically produced.

B. FURNITURE AND UPHOLSTERY.

1. Cabinet Work, plain.
2. Cabinet Work, carved or ornamental.
3. Marqueterie, inlaid Work, in Woods, &c.
4. Buhl or Metallic inlaid Work.
5. Chairs, Sofas, and Beds, and general Upholstery.

C. PAPER-HANGINGS.

1. Damask Patterns.
2. Flower Patterns.
3. Flock and Metal Papers.
4. Decorative Paper-hangings by Block-work.
5. " by any other Process.
6. Machine-printed Paper-hangings.

D. PAPIER-MACHE, JAPANNED GOODS, PEARL, AND TORTOISE-SHELL WORK.

1. Papier-maché, japanned, inlaid, and decorated.
2. Papier-maché (not japanned), produced in ornamental forms for decoration.
3. Japanned Goods in Iron, &c.
4. Pearl and Tortoiseshell Work.

XXVI. Manufactures in Mineral Substances used for Building or Decoration, as in Marble, Slate, Porphyries, Cements, Artificial Stones, &c.

A. MANUFACTURES IN COMMON STONES.

1. For Building, and constructions not strictly decorative.
2. For Decorative purposes.

B. MANUFACTURES IN SLATE.

1. For Construction.
2. For Decoration.

C. MANUFACTURES IN CEMENT AND ARTIFICIAL STONE.

D. MANUFACTURES IN MARBLES, GRANITES, PORPHYRIES, ALABASTER, SPAR, ETC., FOR USEFUL OR ORNAMENTAL PURPOSES.

1. For Construction and external Decoration.
2. For internal Decoration (not Furniture), as Chimney-pieces, &c.
3. For articles of Furniture, as Tables, &c.
4. For purposes of mere Ornament.

E. INLAID WORK IN STONE, MARBLE, AND OTHER MINERAL SUBSTANCES.

F. ORNAMENTAL WORK IN PLASTER, COMPOSITION, SCAGLIOLA, Imitation MARBLE, ETC.

G. COMBINATIONS OF IRON AND OTHER METALS WITH GLASS AND OTHER SUBSTANCES FOR VARIOUS USEFUL PURPOSES.

1. For Architectural purposes.
2. For Miscellaneous purposes.

XXVIII. Manufactures from Animal and Vegetable Substances, not being Woven, Felted, or included in other Sections.

A. MANUFACTURES FROM CAOUTCHOUC.

1. Impermeable Articles.
 - Boots.
 - Holdsworth's Life Preservers.
 - Captain Smith's
 - Hydrostatic Beds.
 - Air
 - Water Cushions.
 - Air "
 - Gas Bags.
 - Printers' Blankets.
 - Cloaks, Capes, Coats, Paletots, &c.
 - Boots and Shoes.
 - Over Shoes, or Goloshes.
 - Fishing Boots.
 - Deck
 - Ship Sheets.
 - Bellows.
 - Air-pump Valves for Steam Engines.
 - Sponge Baths and Bags.
 - Prepared Water and Air proof Textures of every description.
2. Elastic Articles.
 - Railway and other Carriage Springs.
 - Buffers.
 - Valve Canvas.
 - Knee Caps.
 - Surgical Bottles.
 - Pump Buckets and Valves.
 - Bands and Rings for Letters and Packages.
 - Writing Tablets.
 - Trouser Straps.
 - Gussets for Boots.
 - Vest Backs.
 - Washers for Flange and Socket Joints.
 - Driving Bands for Machinery.
 - Railway Felt.
 - Wheel Tires.
3. Articles in Caoutchouc—Moulded, Embossed, Coloured, and Printed.
 - Bas-reliefs.
 - Bags.
 - Maps, printed on Caoutchouc.
 - Sheets, in Colour.
 - Embossed and Printed Ornaments.
 - Garters, Bracelets, &c., Embossed, Coloured, or Printed.
 - Bottles, Embossed and in Colours.
 - Embossed Sheets for Seats and other Purposes.
 - Vulcanized Articles combined with Metal—such as Decanter Stoppers, Inkstands, Cocks and Taps for Fluids, Hinges, Locks and Bolts, Wheel Tires, Plugs for Cisterns, Linings of Vessels, &c.

B. MANUFACTURES FROM GUTTA PERCHA.

1. For Waterproofing Purposes.
2. For Agricultural Uses, as Tubing for Manure, &c.
3. For Maritime Purposes, as Speaking Trumpets, Life Buoys, Life Boats, Cords, Tiller Ropes, &c.
4. Decorative Uses, as Ornamental Mouldings, Brackets, Medallions, Picture Frames, &c.
5. Surgical, Electrical, and Chemical Uses, as Dissolved Gutta Percha for Wounds, Stethoscopes, Splints, Ear Trumpets, &c., Carboys, Funnels, Acid Vessels, &c., Covering of Telegraph Wire, Insulating Stools, &c.
6. Domestic and Miscellaneous Uses, as Soles for Shoes, Linings of Cisterns, Conveyance of Water and Gas, Hearing Apparatus, &c.

C. MANUFACTURES FROM IVORY, TORTOISESHELL, SHELLS, BONE, HORN, BRISTLES, AND VEGETABLE IVORY.**D. GENERAL MANUFACTURES FROM WOOD (not being Furniture).**

1. Turnery.
2. Carving, &c.
3. Coopers Work of all kinds.
4. Basket and Wicker work.
5. Miscellaneous Wood work.

E. MANUFACTURES FROM STRAW, GRASS, AND OTHER SIMILAR MATERIALS.**F. MISCELLANEOUS MANUFACTURES FROM ANIMAL AND VEGETABLE SUBSTANCES.****XXIX. Miscellaneous Manufactures and Small Wares.****A. PERFUMERY AND SOAP.****B. ARTICLES FOR PERSONAL USE, AS WRITING DESKS, DRESSING CASES, WORKBOXES, WHEN NOT EXHIBITED IN CONNEXION WITH PRECIOUS METALS (XXIII.), AND TRAVELLING GEAR GENERALLY.****C. ARTIFICIAL FLOWERS.****D. CANDLES, AND OTHER MEANS OF GIVING LIGHT.****E. CONFECTIONERY OF ALL KINDS.****F. BEADS AND TOYS, WHEN NOT OF HARDWARE, FANS, ETC.****G. UMBRELLAS, PARASOLS, WALKING-STICKS, ETC.****H. FISHING TACKLE OF ALL KINDS, ARCHERY.****I. GAMES OF ALL KINDS.****J. TAXIDERMY.****K. OTHER MISCELLANEOUS MANUFACTURES.****FINE ARTS***(So far as they come within the limitations of the Exhibition).***XXX. Sculpture, Models, and Plastic Art.****A. SCULPTURE AS A FINE ART.**

1. In Metals simple, as Gold, Silver, Copper, Iron, Zinc, Lead, &c.
2. In Metals compound, as Bronze, Electrum, &c.
3. In Minerals simple, as Marble, Stone, Gems, Clay, &c.
4. In elaborate Mineral Materials, as Glass, Porcelain, &c.
5. In Woods and other Vegetable Substances.
6. In Animal Substances, as Ivory, Bone, Shells, Shell Cameos.

B. WORKS IN DIE-SINKING, INTAGLIOS.

1. Coins, Medals, and Models of a Metallic character in any material.
2. Impressions struck from Dies for ornamental purposes.
3. Gems, either in Cameo or in Intaglio, Shell Cameos.
4. Seals, &c.

C. ARCHITECTURAL DECORATIONS.

1. Integral, in Relief, Colour, &c.
2. Adventitious, as Stained Glass, Tapestry, &c.

D. MOSAICS AND INLAID WORKS.

1. In Stone.
2. In Tiles.
3. In Vitrified Materials.
4. In Wood.
5. In Metal.

E. ENAMELS.

1. On Metals.
2. On China.
3. On Glass.

F. MATERIALS AND PROCESSES APPLICABLE TO THE FINE ARTS GENERALLY, INCLUDING FINE ART PRINTING, PRINTING IN COLOUR, ETC. ETC.

1. Encaustic Painting and Fresco.
2. Ornamental Printing, Chromo-typography, Gold-illuminated Typography, Typography combined or uncombined with Embossing.
3. Lithography, Black, Chromo-lithography, Gold-illuminated Lithography, Lithography combined or uncombined with Embossing.
4. Zincography or other modes of Printing.

G. MODELS.

1. In Architecture,
2. Topography.
3. Anatomy.

LYON PLAYFAIR.

OFFICIAL
DESCRIPTIVE AND ILLUSTRATED
CATALOGUE.



2. TABLE OF GOLD AND SILVER ELECTROPLATE, EXHIBITED BY HER MAJESTY.

United



Kingdom.

ARTICLES EXHIBITED BY HER MAJESTY THE QUEEN,
H. R. H. THE PRINCE ALBERT, AND H. R. H. THE PRINCE OF WALES,
IN THE FOUR SECTIONS OF THE EXHIBITION.

HER MAJESTY THE QUEEN.

MAIN AVENUE, EAST.

96 Portrait of Her Majesty on Sèvres china, size of life, half length, by A. Ducluzeau, after a portrait by F. Winterhalter. Painted in 1846.

97 Portrait of H.R.H. Prince Albert, on Sèvres china, size of life, half length, painted by A. Bezanget, after a portrait by F. Winterhalter. These portraits are exhibited jointly by Her Majesty and H.R.H. Prince Albert.

The Great Diamond of Runjeet Singh, called "Koh-i-Noor," or Mountain of Light.

Jewel case in the cinque-cento style, designed by L. Gruner, Esq., and executed at the manufactory of Mr. Henry Elkington, at Birmingham. The material is bronze, gilt and silvered by electro-type process; upon this case are portraits on china of Her Majesty, H.R.H. Prince Albert, and H.R.H. the Prince of Wales, copied from miniatures by R. Thorburn, Esq., A.R.A. The small medallions, representing profiles of their R.H.'s the Princes and Princesses, were modelled from life by Leonard Wyon, Esq.

CLASS 23.—CENTRAL SOUTH GALLERY.

1 Table of gold and silver electro-plate, manufactured by Messrs. Elkington. The top of the table is an electro-type reproduction of a plate of fine workmanship, obtained and copied for Mr. H. Elkington under the direction of the Chevalier de Schlick. The eight subjects in bas-relief represent Minerva, Astrologia, Geometria, Arithmetica, Musica, Rhetorica. The centre figure represents Temperance surrounded by the four elements. At the bottom of this plate is an inscription pointing to the artist. The table is designed by George Stanton, a young artist in the employ of Mr. H. Elkington, and a student in the Birmingham School of Design.

CLASS 30.—FINE ART COURT.

353 A cradle, carved in Turkey boxwood by W. G. Rogers, and designed by his son, symbolising the union of the Royal House of England with that of Saxe Coburg and Gotha. One end exhibits in the centre the armorial bearings of Her Majesty the Queen, surrounded by masses of foliage, natural flowers and birds; on the rocker, beneath, is seen the head of "Nox," represented as a beautiful sleeping female, crowned with a garland of poppies, supported upon bats' wings, and surrounded by the seven planets.

The other end, or the back of the head of the cradle, is devoted to the arms of H.R.H. Prince Albert; the shield

occupies the centre, and round it, among the arabesque foliage, the six crests of the Prince are scattered, with the motto "Treu und fest." Below, on the rocker, is discovered a head of "Sommus" with closed eyes, and over the chin a wimple, which, on each side, terminates in poppies.

In the interior of the head of the cradle, guardian angels are introduced; and above, the royal crown is found embedded in foliage. The friezes, forming the most important part of the sides of the body of the cradle, are composed of roses, poppies, conventional foliage, butterflies, and birds, while beneath them rise a variety of pinks, studied from nature. The edges and the insides of the rockers are enriched with the insignia of royalty and emblems of repose.

CLASS 24.—CENTRAL NORTH GALLERY, I. 27.

20 A pair of richly cut crystal glass candelabra, 8 feet high, carrying 15 lights each. The shaft composed of prisms upwards of 3 feet in length. Designed and manufactured by F. and C. Osler, of Birmingham, and 44 Oxford St. London.

CLASS 19.—CENTRAL NORTH GALLERY, I. 30.

156 Axminster carpet, designed by L. Gruner, Esq., and manufactured at Glasgow, for Mr. Dowbiggen.

379 A Berlin wool carpet executed by one hundred and fifty ladies of Great Britain. The dimensions of this carpet are thirty feet in length, and twenty in breadth. The carpet has been produced in the following manner:—The pattern, originally designed and painted by the artist, has been subdivided into detached squares, which have been worked by different ladies, and on their completion the squares have been reunited, so as to complete the design. In the pattern, which consists partly of geometrical, and partly of floral forms, heraldic emblems are also introduced. The initials of the executants are ornamenteally arranged, so as to form the external border. The whole design is connected by wreaths or bands of leaves and foliage, the centre group representing the store from whence they have been distributed.

The carpet has been produced under the management of a Committee. The design by Mr. J. W. Papworth; the patterns were painted and the work executed under the superintendence of Mr. W. B. Simpson.

CLASS 19.—SOUTH GALLERY, P. 15 to 17.

Axminster carpet, designed by L. Gruner, Esq., and manufactured by Messrs. Blackmore Brothers, at Wilton, for Messrs. Watson, Bell, & Co.

HIS ROYAL HIGHNESS PRINCE ALBERT.

SOUTH TRANSEPT.

15 Group in marble, "Theseus and Amazons," executed at Rome by Joseph Engel, Esq., from Hungary, pupil of the Royal Academy.

CLASS 3.

170 Three samples of grain grown on the royal farms at Windsor, consisting of wheat, oats, and beans, one bushel of each.

CLASS 4.

139 Wool, the production of Cashmere goats kept by His Royal Highness at Windsor. It is imported with a portion of strong white hairs, which it is requisite to have picked out by hand prior to attempting to manufacture the finer portions. These strong hairs are afterwards useful in making coarse woollen cloth.

Examples of these kinds of manufacture from this wool are exhibited in the Central Avenue.

CLASS 27.

140 A block of Parrot coal from West Wemyss colliery, Kirkaldy, Fifeshire, partly polished.

141 Garden seat, designed by L. Gruner, Esq., and executed in Fifeshire by Thomas Williams Waun, of Parrot or cannel coal, from the estate of Rear-Admiral Wemyss.

CLASS 30.

350 Two slabs for tables, designed by L. Gruner, Esq., in the cinque-cento style, executed by Mr. Thomas Woodruff at Bakewell, in Derbyshire stones, in imitation of the Florentine mosaic.

351 Candelabrum in the cinque-cento style, designed by L. Gruner, Esq., modelled by Ant. Trentanove, and executed in seagliola in imitation of giallo antico, by L. Romoli.

HIS ROYAL HIGHNESS PRINCE ALBERT, ON BEHALF OF HIS ROYAL HIGHNESS THE PRINCE OF WALES.

98 Shield presented by His Majesty the King of Prussia to His Royal Highness the Prince of Wales, in commemoration of the baptism of the infant Prince, for whom His Majesty acted as sponsor.

The pictorial embellishments of the shield, the general plan for which was given by the king himself, were designed by Doctor Peter Von Cornelius, and the architectural ornaments by Counsellor Stüler. The execution of the remaining portions—the goldsmiths' work, enamel, &c., were performed by M. G. Hossauer; the modelling by M. A. Fischer; the chasing by M. H. Mertens; and the lapidary work by M. Calandrelli.

In the centre of the shield is a head of Our Saviour. The middle compartment, surrounded by a double line of ornamental work, is divided by a cross into four smaller compartments, which contain emblematic representations of the two Sacraments, Baptism and the Lord's Supper, with their Old Testament types, the opening of the fountain in the rock by Moses, and the fall of manna. At the extremities of the arms of the cross are represented the Evangelists, noting down what they have seen and heard in the Gospels, which are to communicate to all futurity the plan of man's salvation, and prove inexhaustible sources of divine revelation and doctrine.

On the extreme points of the arabesques that rise above the Evangelists, are represented the Christian virtues of Faith, Hope, and Charity, and of Christian Righteousness. Around the entire centre stand in a

circle the twelve Apostles. Peter is seen under Faith represented in the arabesque; on the right and left of him are Philip and Andrew; under Hope is James; on either side are Bartholomew and Simon; John is placed beneath the figure of Charity; on either side are James the younger and Thomas; under Righteousness is Paul; on the right and left are Matthew and Judas Thaddeus, going forth into the world to teach and to baptize, and to propagate the kingdom of the Redeemer.

The relieveo, which runs round the edge of the shield, represents the betrayal, the redeeming atonement of Christ, and his resurrection. Another portion represents Our Lord's triumphant entry into Jerusalem; a third portion the descent of the Holy Ghost, the preaching of the gospel, and the formation of the church. The fourth and principal compartment contains an allegorical representation of the birth of the Prince of Wales, and of the visit of the King of Prussia, accompanied by Baron Humboldt, General von Natzmer, and the Count von Stolberg, and welcomed by H.R.H. Prince Albert and the Duke of Wellington; a Knight of St. George being represented on the beach standing upon a dragon.

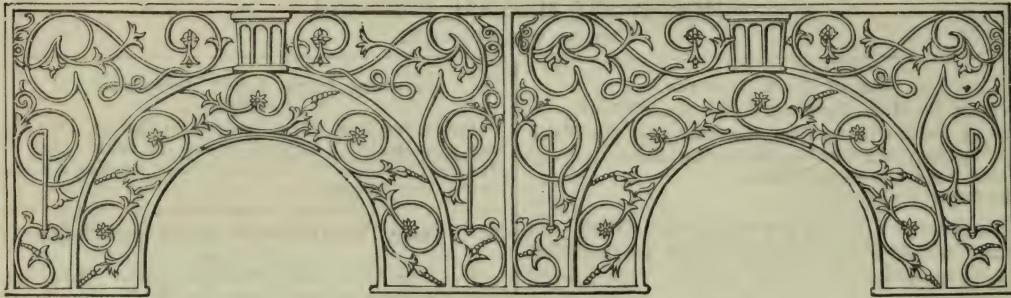
The shield has been denominated the Buckler of Faith. The inscription on the shield runs thus:—

FRIDERICUS GULIELMUS REX BORUSSORUM
ALBETO EDUARDO, PRINCIPI WALLIÆ,
IN MEMORIAM DIEI BAPT. XXV JAN. A. MDCCXLII.

ZOLLVEREIN, OCTAGON ROOM, No. 836.

COUNT ERNEST OF COBURG-GOTHA.

Fruit stones of various sizes, carved with a penknife.



MINING AND MINERAL PRODUCTS

OUTSIDE THE BUILDING.

1 ORGAN, JOHN, *Penzance, Cornwall*— Manufacturer.

Baptismal font; chimney-piece; chess table; obelisks, columns, vases, carved and plain; cabinet of specimens; slabs, moulded, polished, and unpolished, made of serpentine stone from the quarries at Lizard, Penzance.

Blocks, illustrating the material in its raw state, and in different stages of manufacture.

[The serpentine of Cornwall is a green mineral, passing into yellow and red, the colour being often veined, spotted, dotted, and clouded. It is soft in the quarry, but becomes hard on exposure, and cuts readily, but its fracture is irregular. It is soft to the touch, but not greasy like steatite or talc; is indented by a blow of a hammer; is infusible before the blow-pipe; but parts with water by calcination, and hardens by exposure to heat. It is slightly acted on by acids.

As a rock, serpentine is often mixed with other minerals, so that different specimens do not yield the same result on analysis. It usually contains, when pure, silica 42 to 44, magnesia 36 to 38, water 12 to 13, and is therefore a silicate of magnesia. Its colour is due to oxide of chromium, but it contains often much iron, and is sometimes magnetic.

The serpentine of Cornwall is considered to exhibit four varieties, differing much in hardness, these are called precious, common, steatitic, and ollareous; but the best kinds for ornamental purposes on a large scale are those found at Kennack Cove, the Balk, and Cadgwith, where large blocks can be obtained. The block placed outside the building near the south-western exit will show the magnitude and capability of such blocks.

A considerable quantity of the serpentine of the Lizard is annually shipped to Bristol, for the manufacture of carbonate of magnesia.—D. T. A.]

2 BOARD, —, (J. Donohue, *New Road*, Agent). Two figures in artificial stone.

3 TEAGLE, R. & W., 42 *Hertford Street, Chelsea*— Inventors and Manufacturers.

A figure of Lazarus, in artificial stone; cast taken from a carved wood figure.

Patent sweeping apparatus for flues.

4 RAYSDALE, W. Blocks of gypsum used in the manufacture of plaster.

5 ROBINS, ASPDIN, & COX, *Northfleet, and Great Scotland Yard, Whitehall*—Manufacturers.

Slab of Portland cement, to show the strength of this material for making landings, cills, paving, &c. Iron

testing-socket, for proving the strength of the cement. Bricks cemented together, equal to a pressure of three tons on the first brick. Beam of cement. Bricks, joined together with one portion of cement and four of sand. Step of Portland cement. Block of cement, which bore a pressure of upwards of 250 tons, tested by Bramah's hydraulic press. Similar block, one portion of cement, and four of sand, which bore a pressure of 120 tons. Block of Portland stone of like dimensions, which broke under pressure. Brick beam, one portion of cement and three of sand; sustaining a weight of $3\frac{1}{2}$ tons. Bricks, joined together with one portion of cement, and three of sand, bearing a weight of one ton. Blocks of the hardest Yorkshire stone, joined by one portion of cement, and one of sand, sustaining a weight of three tons. Cement tank. Model of Mazeppa, in patent Portland cement.

[Portland cement is formed by calcining together lime-stone and some argillaceous earth, the result being a mass, which rapidly absorbs a certain quantity of water and then becomes solid, as a hydrous silicate of lime. The advantages over natural hydraulic limes consist generally of greater hardness and durability, arising from the mixture of material being more perfectly under command.—D. T. A.]

6 MOPHET, JONATHAN, *Studfold, near Settle*— Producer.

Specimens of stone called blue flag, or Grauwacke. Obtained from Horton Wood quarries, which have been worked probably about 100 years. This stone is principally used for cisterns and partitions, and is useful for carriers' tables, tanks, &c.

The quarries are about six miles from the Settle Station of the North Western Railway.

7 GREAVES, R., *Warwick*—Producer.

Blue lias limestone. Models in lias, Portland, and improved Roman cement, &c.

8 OLD DELABOLE SLATE Co. (by J. Carter), *Camelford*—Producer.

Slate slab, as raised from the quarries at Delabole. Slate cistern.—(See Class 1, No. 214.)

9 STIRLING, J. jun., *Belvidere Road, Lambeth*— Designer, Inventor, and Manufacturer.

Specimens of slate.—(See Class 1, No. 209.)

10 WHITE & SONS, *Westminster*—Manufacturers. Illustrations of the strength of cement.—(See Class 1, No. 130.)

11 SEELEY, JOHN, *Keppel Row, New Road*— Manufacturer.

Mercury, after Giov. da Bologna, in artificial stone.

12 **WELSH SLATE COMPANY.**
BARWIS, W. H. B., *Secretary, 1 New Boswell Court.*
Rough block of slate from the quarry of the Welsh Slate Company, at Festiniog, Merionethshire.
Slabs of slate, sawn and planed.
Roofing and other slates.
[The slates of Festiniog are of admirable quality, and obtained in slabs of very large dimensions, adapted to all the more important uses of the material. The quarries are extensive, and give employment to a large population.—D. T. A.]

13 **SINCLAIR, J., Forse, Thurso, Scotland—Manufacturer.**
A cistern or bath of Forse-Rockhill flag. Samples of the stone, showing the natural surface, the half-rubbed and the full-rubbed surface, &c.

14 **FREEMAN, W. & J., Millbank Street, Westminster—Producer.**
An obelisk in granite. Sundry large slabs and blocks of stone.

16 **STRUTHERS, WILLIAM SAMUEL, 7 Holywell Street, Westminster—Manufacturer.**
Slate water filter, the water being filtered in its ascent.
[The filtration of water by ascension is a simple mechanical process, of considerable use in the arts, and capable of many modifications. The cistern, in such case, is furnished with two perforated shelves or false bottoms, between which the filtering medium is packed. At some distance above these is a third shelf, with a water-tight communication through the intervening chamber and the filter bed, and opening into the bottom of the cistern. The foul water being let into the upper chamber, a cistern passes down into the bottom one by means of the tube, and is then forced up through the filter-beds by the presence of the water in the column. The pure water is thus delivered into the intervening space, whence it may be drawn off at convenience. Slate is an admirable material for cisterns of all kinds, from its great strength, perfect cleanliness, and complete impermeability to water.]—D. T. A.

17 **Specimens of Irish flagging.**

18 **SHARP, SAMUEL, Commercial Road, Lambeth, Agent to ALEXANDER ADAM, Wick, N. Britain—Proprietor.**
Rockhill paving stones, from the original quarries, shipped from the port of Wick, showing the different thicknesses as they naturally arise in the quarries.

19 **FURSE, THOMAS WM., 96 High Street, Whitechapel—Inventor and Manufacturer.**
Specimens of waterproof artificial stone, as applicable for sewers and drains of large dimensions; for flooring churches, vestibules, public buildings, hospitals, and damp cellars. Drains for railways, &c. Drop-stone. Cistern of the same, containing bricks united with fusible mineral cement, to prevent the ascent of damp in foundations, &c. Ornamental brick of the same.
Sample of fusible mineral cement, which when gauged with 150 per cent. of dry sharp sand, unites bricks and stones so firmly that they cannot again be separated.

20 **CARNEGIE, W. F. L. Kinblethmont, Arbroath, Scotland—Proprietor.**
Flagstones and freestones, known as Arbroath pavement, from Leysmill Quarries, dressed by Hunter's stone-planing machine.—(See Class 1, No. 198.)

22 **HAYWOOD, JONAS, Ardsley, near Barnsley—Producer.**
Grindstones from the Ardsley Oaks Quarry, Barnsley, used principally in Lancashire and Yorkshire, for the grinding of machinery, files, edge tools, needles, &c., and for building purposes.

23 **DOVE, DUGALD, Nitshill, Hurlet, near Glasgow—Producer.**
Freestone block, from Nitshill quarry. Grindstone from the same quarry, three feet in diameter by six inches thick.
[The sandstones and greenstones of Nitshill are chiefly or entirely of the carboniferous period, and include several kinds of various degrees of excellence.—D. T. A.]

24 **BEDFORD, BONSON, DRAKE, & Co., Oaks Quarry, near Barnsley—Producers.**
Grindstones from the Oaks Quarry, near Barnsley, 8 feet in diameter and 14 inches thick, for grinding machinery; 4 feet in diameter and 6 inches thick, for grinding tools; 2 feet 6 inches in diameter and 9 inches thick, for grinding files.

25 **RAYNES, LUPTON, & Co., Liverpool—Producers.**
Specimens of pure limestone, from Pentregwyddel quarries, near Abergel, Denbighshire; used in the rough state, in chemical manufactures, and as building cement (lime); and in the manufactured state, as a lithographic stone, &c.
Specimens of stone, from Graig-lwyd quarries (Penmaen-Mawr, Carnarvonshire), cut into paving, channel, and kerb-stones, and arranged in a frame as they would appear in a street pavement; and shown in a block, used as wheelers, or tram-road stones, channels, &c.
[The stone from Penmaen-mawr, here exhibited, is an extremely hard compact rock of igneous origin, admirably adapted, from its toughness, for all kinds of paving purposes. It is much used in the neighbourhood of Liverpool, and is also exported largely.—D. T. A.]

26 **PENZANCE SERPENTINE COMPANY.**
A block of rough serpentine.

27 **TOWLER, EDWARD, Market Rasen.**
Stones adapted for paving, walling, road-making, and polishing, from Kirton Lindsey's Tunnel Stone Works, containing 95 per cent. of carbonate of lime.
Blue lias and hydraulic cement.

28 **FRANKLIN, P. S. Galway, Ireland—Proprietor.**
Block of stone, partly polished. Block of marble and paving-stones.

29 **BROWN, RUSBY, & BOOTH, Sheffield—Producers and Manufacturers.**
Flags and steps. Block: four tons.

34 **OAKELEY, EDWARD, Coed Talon, near Mold, Flintshire, Wales.**
Steam-coal from Coed Talon and Leeswood collieries, near Mold, North Wales.
[This noble column of coal, said to weigh 16 tons, is from the main coal of the Flintshire coal-field, a seam nine feet thick, accompanied by five other beds of coal and four beds of ironstone. The quality of the coal is bituminous, and the proportion of ash less than 3 per cent. The Flintshire coal-field is a narrow strip, partly covered with new red sandstone, and extends 40 miles from north to south, with an ascertained breadth of from two to 12 miles, being cut off by a north and south fault. The mines supplying the specimen extend over 1,300

acres, and were opened about 30 years ago. About 2,000 tons of coal per week are raised from them.—D. T. A.]

35 BUCKINGHAM, J., 13 Judd Place, East, New Road—
Producer and Importer.

Anthracite coal, from Tenby, South Wales. Specimens of patented artificial stone.

36 ROUND, D. G., Hange Colliery, Tipton, near
Birmingham—Producer and Proprietor.

Specimens of iron ore.

Specimen of coal from the thirty feet, or thick coal seam of South Staffordshire, cut out of the solid coal. This specimen is of the largest dimensions that could be brought out of the mine up a seven-feet circular shaft. It measures eighteen feet in circumference, and weighs five tons.

The rope used in lifting it, is also exhibited; it was manufactured by Mr. Wm. A. Chubb, of Woodpark, Devonport.

The chains used in sending the coal out of the mine are shown in connexion with the rope; the block was raised by means of the ordinary machinery employed in the colliery. The picks used in hewing the coal.

[The thick coal seam of Staffordshire, of which a complete section is given by the exhibitors, and of which also a fine block weighing 5 tons is shown by Mr. Round, does not extend over a very large area, consisting, in fact, of the accidental junction of several seams with very thin and carbonaceous bands. The whole are necessarily worked together, and below them are no less than eight other seams (one of them 9 feet thick) worked near Wolverhampton. The district yields much ironstone, and the coal is being rapidly abstracted, being used to an enormous extent for manufacturing purposes and iron smelting in the neighbourhood of Birmingham.—D. T. A.]

37 JAMES & AUBREY, Swansea—Producers.

A large block of anthracite, or stone coal, from Cwmlynfell, in the Swansea valley.

[The great South-Welsh coal-field includes, at a moderate estimate, as much as 1,000 square miles of country, unequally divided between bituminous coal and anthracite, the dividing line being nearly coincident with the Neath Valley, and the anthracite portion extending to the west. The anthracite has only recently been introduced into use, but is now recognised as a very important material, the different kinds being of great value for special purposes, and yielding sometimes as much as 92 per cent. of carbon. The pure Welsh anthracite has been found to evaporate 10 lb. 8½ oz. water, by one pound of coal, the best bituminous coal not evaporating more than 8 lbs. There is no reason to suppose any difference in geological age between the bituminous and anthracite coals.—D. T. A.]

38 INCE HALL COAL & CANNEL COMPANY, Wigan.
Blocks of Arley and Pemberton coal.

39 CAMERON'S COALBROOK STEAM COAL and SWANSEA
and LOUGHOR RAILWAY COMPANY, 2 Moorgate
Street.

Specimen of steam coal (of a quality intermediate between bituminous coal and anthracite), from the mines near Loughor, in the county of Glamorgan, South Wales, which have been worked about eight years. It is exported from the ports of Swansea and Llanelli in the Bristol Channel.

40 HAINES, RICHARD, & SONS, Denbigh Hall, Tipton,
Staffordshire—Proprietors.

Large specimen of the Staffordshire thick, or ten-yard coal; height, 9 feet 6 inches; circumference, 21 feet 10 inches; weight, 13 tons. Brought 70 yards underground to the bottom of the shaft, and raised from a depth of 165 yards by the ordinary steam-engine, with no other apparatus than that regularly in use.

41 BARROW, R. Staveley Works, near Chesterfield,
Derbyshire.

Coal from the mines of Staveley, county of Derby, raised from a shaft 459 feet deep. The block is estimated to weigh 24 tons.—(See Class 1, No. 255.)

42 JONES, SELLS, & Co., 55 Bankside, Southwark—
Agents.

Anthracite coal, from Llanelli, South Wales.—(See Class 1, No. 258.)

43 DAVIS, D., Hirwain, near Merthyr Tydfil, Wales—
Proprietor.

The Blaengawr steam coal, from Aberdare.

44 NEATH ABBEY COAL COMPANY.

Brynddwey coal, from between the vales of Neath and Swansea. Anthracite coal from the western side of the vale of Neath.

45 PROTHERO & PRICE, Tillery, near Newport, South
Wales—Producers.

Steam coal, from Tillery, near Newport, Monmouthshire, the produce of a newly-opened colliery (in the South Wales coal basin), upon the steam-coal vein, "the Ell'd," a 5-foot vein; the "big coal," an 8-foot vein; and the "½ coal," an 8-foot 7-inch vein; all of superior quality.

The coal is obtainable in masses of 50 tons weight, and is adapted for steam purposes, and for exportation.

47 THE BRYMBO COMPANY, Wrexham, Wales—
Producers.

Block of coal, from Brymbo, near Wrexham, North Wales.

48 FITZWILLIAM, Earl CHARLES WILLIAM, Wentworth
House, near Rotherham—Producer.

Pillar, exhibiting a complete section of the Barnsley thick bed of coal, from the Elsick colliery, and showing the different portions applicable for steam-engines and manufacturing purposes, and for domestic uses.

[The Barnsley coal is well illustrated in the Exhibition, as there will be found no less than three columns of it; two representing the whole thickness of what is called the thick bed, and the other from Silkstone, showing a beautiful variety of coal also found in the district. The situation of Barnsley, in the centre of the great coal-field of Yorkshire, and the abundance and quality of its coal, render it important among the inland towns producing mineral fuel. There are three principal varieties, viz., hard-stone coal, soft or tender coal, and Cannel. The iridescent or peacock coal may almost be regarded as a fourth. The coal is worked long-wall method.—D. T. A.]

49 ABERCARN COAL COMPANY.

Block of steam coal.

50 GILMOUR, A., & Co., Kilmarnock, Scotland—
Proprietors.

Coal from Hurlford and Skerrington Colliery, near Kilmarnock, exported from the port of Troon, and used principally for steam purposes. The colliery has been worked for upwards of forty years. Thickness of seam, 11 feet.

[The Kilmarnock coal field, in Ayrshire, closely adjoins, and perhaps forms part of that worked a little to the south-west at Ayr. The coal is anthracitic for the most part, especially when near the trap dykes that intersect the district; but there are in the neighbourhood many seams of bituminous quality. As much as 150,000 tons of coal are exported from the Kilmarnock district.—D. T. A.]

52 CRUTTWELL, ALLIES, & Co., *Cwm Celyn and Blaina Iron Works, Abergavenny*—Manufacturers.

Pieces of pig-iron, forge pig-iron, and refined metal; and cinder, or scoria, produced from them.

Puddled, merchant, and beat bar iron, with scoria.

Finished rail, showing fracture.

Specimen of sigillaria, from the lower coal measures, Cwm Celyn and Blaina Iron works.

Rails connected, showing a new mode of fastening. The mode of riveting the rails to the chairs with lateral pins or rivets is the patent invention of H. D. Bird, Esq., of Petersburg, Virginia.

53 BAGNALL & GESSON, *West Bromwich, near Birmingham*—Producers.

Column of South Staffordshire thick coal—showing the different working seams as they exist in vertical section.

54 CHEESEWRING GRANITE COMPANY.—Agent in London, Edward Turner, Belvidere Road, Lambeth.

Granite column upon a pedestal about 30 feet high, from the Cheesewring granite quarries, on the Manor of Rollaton, near Liskeard, Cornwall, belonging to the Prince of Wales. The pedestal, cap and base to the column, worked at the Cheesewring granite wharf, Belvidere road, Lambeth, and the shaft at the quarries.

[The quarries which have produced this noble column have not hitherto been much worked, but are capable of great extension, the magnitude of the blocks obtainable from them being almost unlimited. The granite will be seen to be of excellent quality.—D. T. A.]

55 FOX, HENDERSON, & Co.
Large anchor.

57 LONGRIDGE & Co.
Large anchor.

58 BROWN, LENNOX, & Co.
Large anchor.

59 BATEMAN, —.
Two life-boats.

60 YOUNG, —.
Railway gates.

61 DENCH, —.
Two greenhouses on a new construction.

62 KENT, J., *Chichester*.
New mode of glazing greenhouses.

63 PHILLIPS, C., *Weston-super-Mare*—Manufacturer.
Flower-pots, &c. of superior clay. Flower guards and seed basins, strawberry tiles, striking pans, &c.

64 DOULTON & Co., *Lambeth*—Manufacturers.
Large pipe in stone ware, and other articles.

65 SINGER & Co., *Vauxhall Pottery*—Manufacturers.
A still, and other articles in stone ware.

66 FERGUSON, MILLER, & Co., *Heathfield, near Glasgow*—Manufacturers.
Pipes and other large stone ware.

67 GREEN, S. & Co.
Large stone ware.

68 GRANGEMOUTH COAL COMPANY, *Grangemouth, Sunderland*—Manufacturers.
Sundry objects in stone ware.

69 GARNKIRK COMPANY (Sprot, M. & T.)
Sundry articles in stone ware.

70 RAMSAY, G. H., *Derwent Haugh, Newcastle*—
Inventor.
Fire-clay goods.

71 FRANCIS & SONS, *Nine Elms*, Manufacturers.
Drain pipes manufactured by machinery.

75 HOSKEN, RICHARD, *Penryn, Cornwall*—
Manufacturer.

Granite obelisk and base (two pieces), being together 20 feet high, weighing about 15 tons. Exhibited to show the quality of the Cornish granite. Taken from the quarries at Carnseu, near Penryn. Of this material a great quantity was used in the construction of new London bridge.

[The granite best known as *Cornish*, is that obtained from near Penryn, which has been long and extensively used for various public works in England. It is obtained from various localities, and several qualities are employed, the finer kinds being very good. The whole quantity shipped at Penryn varies exceedingly in different years, amounting sometimes to nearly 20,000 tons, but is generally far less, often not a fourth part. The approximate value may be stated at about 1s. 9d. per cube foot before export, and the weight is usually taken at 14 cubic feet to the ton.—D. T. A.]

At some distance from the western extremity of the building is a colossal equestrian statue of Richard Coeur de Lion, by the Baron MAROCHETTI.

The paving in the south enclosure is laid down by three exhibitors, Mr. SINCLAIR, Caithness; Messrs. BROWN, RUSBY, and Co. Yorkshire; and Mr. FRANKLIN, Ireland.

Fountain.

The pavement is laid by the SEYSEL ASPHALTE COMPANY, in their prepared asphalte.

The pavement at the South, or Transept entrance, consists of slate slabs from Festiniog, North Wales.

15.9.14

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